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October
1988

COMPUTE!'s GAZETTE™

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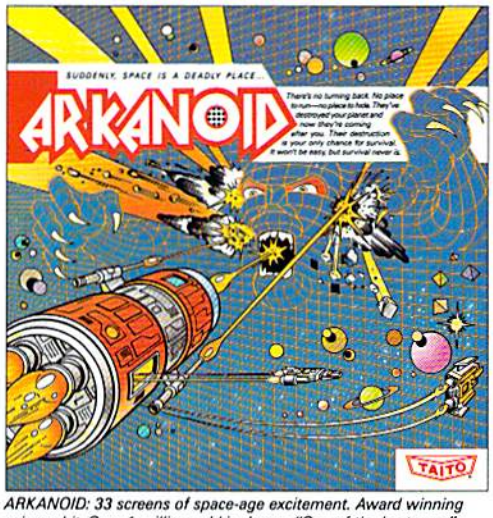
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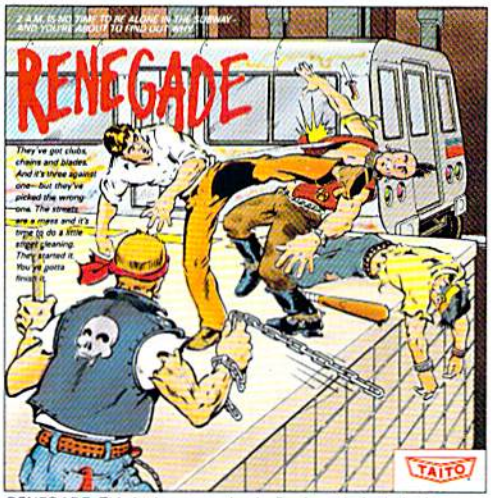
ARKANOID: 33 screens of space-age excitement. Award winning coin-op hit. Over 1 million sold in Japan. "One of the best ever." —Electronic Game Player Magazine.


2 A.M. IS NO TIME TO BE ALONE IN THE SUBWAY... AND YOU'RE ABOUT TO FIND OUT WHY.
RENEGADE
They've got clubs, chains and blades. And it's three against one—but they've picked the wrong one. The streets are a mess and it's time to do a little street cleaning. They started it. You've gotta finish it.
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RENEGADE: This is the one and only. Don't settle for imitations. Blistering, fast paced and real life street-style Karate action. One of the hottest games in Europe.

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Taito is the arcade industry leader for a very good reason. We consistently make great video games that bring more action, thrills and value to the people who play our games. And literally millions of people play our games in arcades and homes all over the world.

Our strength comes from the massive development effort we put into creating the kind of games that satisfy the ever-growing arcade appetite and the research gathered from the more than 100,000 arcade machines Taito operates in Japan. (The money in the coin boxes at the end of the day tells you quickly if you've got

ALCON: The ultimate in inter-planetary combat. Battle aliens with lasers, homing missiles, bombs and shields. Fantastic vertical scrolling future-world landscapes.

Taito Software Inc., 267 West Esplanade, North Vancouver, B.C., Canada V7M1A5. Tel: 604-984-3344. Taito,® Arkanoid,™ Renegade,™ Alcon,™ Rastan,™ Bubble Bobble,™ Operation Wolf,™ Sky Shark™ and Gladiator™ are trademarks of Taito America, Inc. Copyright ©1988. All rights reserved. Amiga, Commodore, Apple, IBM and Atari are trademarks respectively of Commodore-

a good game or not.) And Taito is always working hard to develop the most exciting new video games that push the technology to its limits. We don't rest on our laurels.*

Because arcade games are the benchmark for home video games, Taito's leadership in the arcade industry means that when you buy Taito products you will be getting more home video thrills —more mesmerizing arcade quality graphics, spell-binding sound and above all, action!

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Amiga, Inc., Commodore Electronics, Ltd., Apple Computer Inc., International Business Machines and Atari Corporation. Advertisement by Qually & Company Inc., (Chicago.) *If you think you've got the technical and creative ability to develop mind-blowing video games, write to Taito, Attention: Product Development, at the above address.

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Cover art by Rhett Anderson

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editor's notes

We receive a lot of reader mail with requests and suggestions for any number of things. Having looked closely at the most common requests, we've responded to some of these in the past few issues, and we're addressing more in this issue and in next month's.

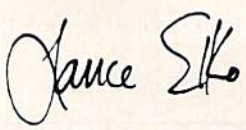
For years, we've run 800-numbers for fulfillment of orders for back issues of magazines and disks. Many of you complained about never being able to get through. We made periodic calls ourselves, and our conclusion was the same. Beginning a couple of issues ago, we started running an order form with a coupon. (It appears on page 58 in this issue.) We're now handling back issues here at the COMPUTE! offices.

On a related note, many of you wanted to know what issues and monthly disks were available. A full-page listing appeared last month for the first time in several years, and this month you'll find it on page 25. (We'll keep this list updated and appearing regularly.)

It's no surprise that many of the requests we get are for *SpeedScript* disks and utilities. *SpeedScript*, our own venerable word processor, is perhaps the most popular program ever published by any magazine. We still regularly fill back orders. And many of you who use *SpeedScript* have requested that we bundle the many support utilities that have appeared throughout more than four years' worth of issues. We're happy to say that we now have such a disk available. It includes the most recent version of *SpeedScript* (3.2) and *SpeedScript 128* (the 80-column version that utilizes the 128's extra memory), plus spelling checkers for each version, printer utilities, mail merge, word count, and many other *SpeedScript* support utilities for both 64 and 128 versions. It also includes disk-speed-up programs and a fast copy utility. Full documentation for each program is included. Patrick Parrish, our staff technical editor, has done an outstanding job of putting this disk together in a clear and easy-to-use format, and we're convinced that you'll be delighted with it. For ordering information, see page 31.

A disk-only project that's nearing completion is the *GAZETTE* five-year index. We'll have details in the next issue. For those of you who don't like to type in programs and who find the *GAZETTE* monthly disk a little too expensive for the budget, we'll have the *Best of GAZETTE Disk* (1988), with a collection of the best programs we've published in 1988. Details for this will also appear in next month's issue. And for those who have Amigas (presumably you still use your 64 or 128, or you wouldn't be reading this magazine), we have our *Amiga Games Disk*. Although the ad (page 33) claims 15 games, we made it 16 just before shipping the disk for production.

For those who may comment that we're creating these disks merely as revenue builders, it should be pointed out that the impetus for these products is reader requests. Also, we're selling each of these disks in the $5.95–$9.95 range. Enough said.



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Senior Editor

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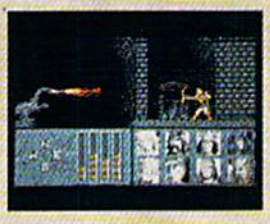

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STRATEGIC SIMULATIONS, INC.

letters to the editor

Send questions or comments to "Letters to the Editor," COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We reserve the right to edit letters for clarity and length.

Outright Omission

In the August issue, I noticed that the "Buyer's Guide to Music Composition and Programming Software" omitted COMPUTE!'s own music system, *The Enhanced Sidplayer*. *Sidplayer* is currently the most popular music system for the 64 and 128. Over 6000 songs have been created by people using the system. In fact, a manager at Quantum-Link told me that half of the service's file space is taken up by *Sidplayer* files.

Sidplayer is popular because it lets both novices and more experienced musicians easily create songs of high quality, and because the songs can be shared with other Commodore users. I realize that it may be awkward for COMPUTE! to list its own product, but I think your readers would want to be aware of such a popular music system.

As a service to your readers, I hope you'll include *The Enhanced Sidplayer* in future listings of music software.

Craig Chamberlain, Sidplayer *author*
Birmingham, MI

We did, unintentionally, omit this very fine music program from our "Buyer's Guide." We won't forget next time. COMPUTE!'s Music System for the Commodore 128 and 64: The Enhanced Sidplayer *is published by COMPUTE! Books and may be found in bookstores which carry COMPUTE! titles. For direct orders, write to COMPUTE! Books, P.O. Box 2165, Radnor, PA 19089, or call 1-800-346-6767 (Mastercard or Visa credit card numbers accepted). The price of the book/disk combo is $24.95, plus $2.00 shipping and handling.*

Don't Call Tom

I'd like to thank Tom Netsel for his excellent coverage of my BBS, Harbour Lights, in the "Going Online: Getting in Touch with Some of the Best Commodore Bulletin Boards" feature (January). This publicity has brought in users from as far away as the United Arab Emirates, Alaska, Hawaii, Puerto Rico, and almost every state in the union. I've had so many new users that I've had to invest in a 20-meg Lt. Kernal hard drive!

People have been calling Tom complaining about some of the contents of my BBS. I try to cater to a diverse group of people and cannot please them all, but Tom should not be the one to be bothered. I have a voice help-line number that is clearly posted for any such complaints.

Again, thanks to *GAZETTE* and Tom Netsel.

Rick Lembree
Kennebunkport, ME

What's Shrinking?

In this column of the July issue ("The Rumor Mill"), you say "We don't know how these rumors got started" about the imminent demise of *GAZETTE*. I haven't heard these rumors, but I'll tell you how they start.

The only thing you have to do is pick up a recent *GAZETTE*. What do you notice? It's much thinner than it used to be. To confirm, I went back to my earliest issue (July 1984). Compare, in succeeding July issues, the total number of pages:

1984 160 pages
1985 128 pages
1986 128 pages
1987 116 pages
1988 100 pages

What would be your conclusion?

O. A. Pickett
Pensacola, FL

Our conclusion is that the size of the magazine is driven by a number of factors beyond our control. The market for the Commodore 64 boomed in 1983–1985. There were dozens and dozens of software publishers, most of whom were eager to advertise to users who, at the time, couldn't get enough software. That number has tapered off considerably over the past two years as some of these companies have dissolved, merged with others, sold out, or pursued other markets (MS-DOS and Amiga, for example). It's nothing we didn't expect or anticipate. What we have now is what we refer to as a mature market: a stable, interested readership and a stronger and more serious, albeit smaller, group of software publishers.

Magazine sizes are determined to a large degree by advertising support. You'll notice that while we are smaller in size than we were a few years ago, our editorial/advertising ratio has not changed appreciably since we started up in 1983. We also note with interest that our competitors' magazines have also gone through the same transformation over the years—further support for our "mature market" premise.

Incidentally, if you look at the format of GAZETTE *up through the August 1985 issue, you'll notice that we used two-column pages with larger type. In the September issue, we changed to three-column pages and smaller type (the current format). The result of this change was that we fit in an average of 25 percent more editorial content per issue.*

Nice to Come Home To

As a long-time subscriber, let me say "Job well done for five years." I purchased my 64 in late 1983. This year, I purchased a 128D with 1570 and 1581 disk drives.

I use an IBM PC at work, and I'm on it up to six hours a day. It's nice to come home to a friendly Commodore with an operating system I can understand. I'll never know how MS-DOS became such a standard. Friends come over and see the 128D operate and are amazed at what can be done without hundreds of dollars' worth of add-on boards, mega-bucks' worth of programs, and so on. I like to show them things that the 8086 and 8088 will never do.

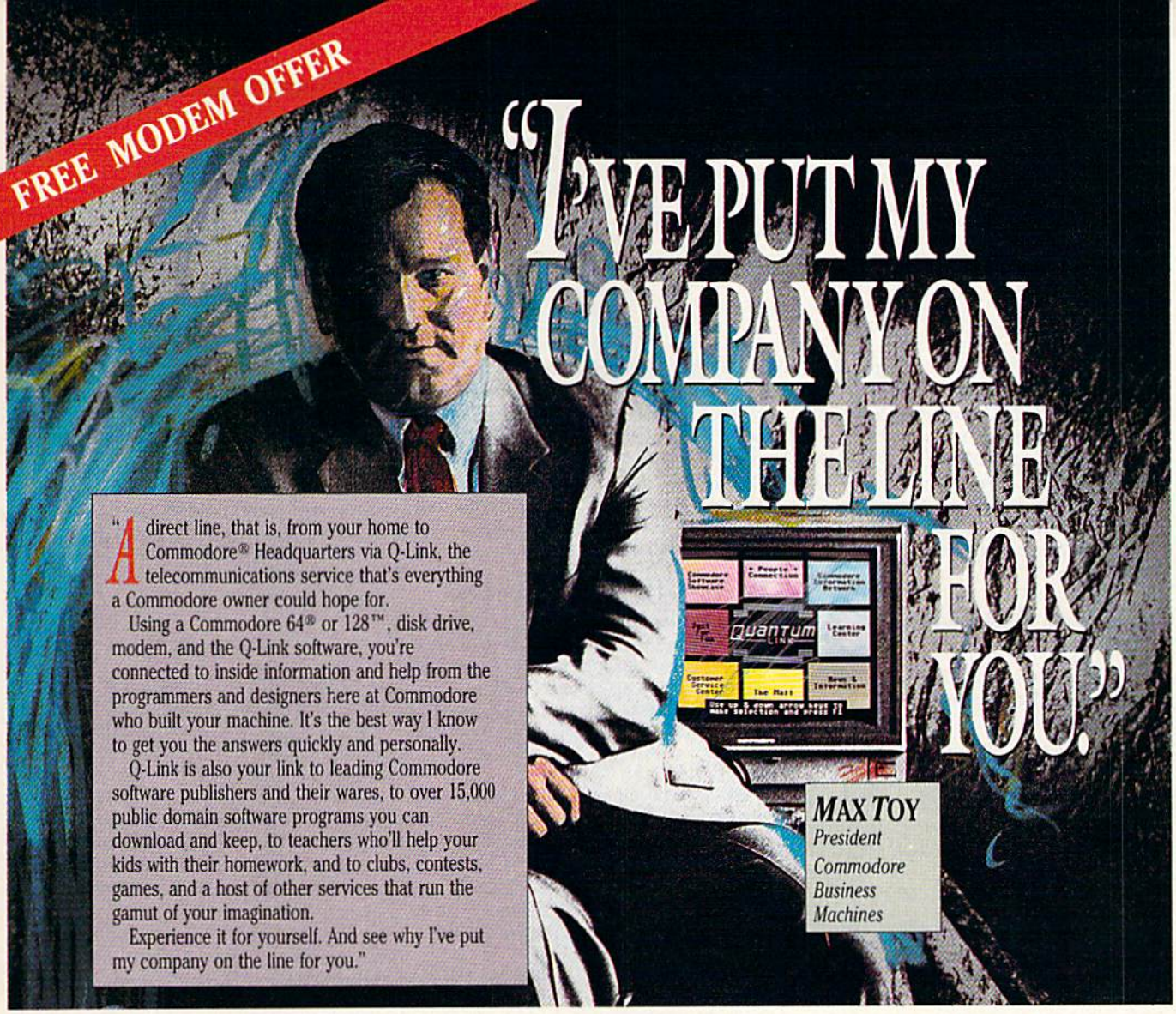
If any readers are asking what kind of home computer to buy and may be considering an IBM PC or clone, have them call me. I can fix that quick.

James Knauss
Houston, TX

Wrong Score

The review of *Apollo 18* in your July issue is incorrect. A perfect score is 100, not 25. Since I enjoy this program so much, I'd like to see that a correction is made so that those who own or are considering buying *Apollo 18* understand that shooting for a high score of 25 is a great underachievement.

Michael Foote
Union Gap, WA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This offer is only valid for new members who respond to this advertisment.
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Q-link SM

The Commodore Connection.

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, NC 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.

Getting the Most from Your SYStem

I'm a new Commodore 64 user. What is a SYS number, and how do you determine what the numbers are?

David Wheelock
Greenville, MI

I have a program which requires a SYS to run it. I've lost the documentation, and I can't remember what the correct number is. How do I find out? I tried the most common numbers (SYS 49152, for example), but with no luck.

Joe C. Zegers
Sunnyvale, CA

The SYS (for SYStem) command causes the computer to leave BASIC, run a machine language (ML) program or routine, and then return to BASIC. It's analogous to BASIC's GOSUB statement, which instructs BASIC to branch to a BASIC subroutine.

The number following SYS is the address of the first byte that is executed when the ML routine is called—sometimes referred to as the initialization address. *In most cases, this address coincides with the starting, or load, address for the routine. The simpliest way to determine whether the starting and the initialization addresses are actually one and the same, is to SYS to the beginning of the ML routine. If the program runs with no hitches, the two addresses are probably identical.*

To find where an ML routine resides in memory, read the first two bytes of the machine language file from disk or tape (using GET). These two bytes are the load address for the routine, in low-byte/high-byte form. To calculate the address represented by these two bytes, multiply the high byte by 256 and add this value to the low byte. Incidentally, this is the method used by "MetaBASIC's" START command. (We last published MetaBASIC in February 1987—see the "Gazette Back Issues" ad elsewhere in this issue for ordering information.)

If the initialization address of an ML routine differs from the starting address, another approach must be taken. In such cases, you'll need to load the machine language routine into a monitor and disassemble the code. If you're lucky, you'll be able to trace the flow of the program and find where it starts.

Changing 1541 Device Numbers

I just received a 1571 drive for my 128. I'd like to change my 1541 to make it a second drive. Unfortunately, the manual doesn't explain very well how to change it to device 9. Can you help?

Jay Howard
Port Orange, FL

If you have two or more drives attached to your computer, each one must have a different device number. You can connect as many as four drives, numbered 8–11, to a Commodore 64 or 128. Permanently assigning a different device number to a 1541 requires a minor hardware modification. Here's how to make it.

First, be sure the power to the 1541 is disconnected. Then remove the outer cover. It's held on by four screws on the bottom of the case. Next, remove the metal heat shield covering the circuit board.

Making the device-number change requires cutting jumpers. There are two jumpers located side by side on the board. Don't look for wires; the jumpers resemble two flat screw heads about 3/16 inch in diameter on the surface of the board. Their location depends on the age of the drive.

Each jumper is actually a very small metal bridge between the halves of the "screw head." To remove a jumper, simply use a knife to scratch away the bridge. Be sure the connection is completely severed. A magnifying lens is handy here.

Remove the front jumper to change the drive to device 9, the back jumper to change it to device 10, or both to change it to device 11. If you remove the wrong jumper, don't be concerned—you can always resolder the severed connection.

Once you've made the modification, you can connect the drives in any order in the serial-bus chain. To test the modification, attempt to load a directory using the new device number. If the computer doesn't recognize the new device number, disconnect the drive and make sure the jumper is completely severed.

If you'd rather not make the change yourself, your local Commodore Service Center should be able to help.

Notch or Not?

Some commercial software packages come on disks without a notch. Is this a form of copy-protection? What would happen if the disks were notched with a paper punch?

Julian De Zela
Kingshill, Virgin Islands

The notch in a disk jacket (the plastic sheath surrounding the disk itself) permits passage of a narrow beam of light inside the drive. When this light beam is able to pass through the notch, the drive can read from or write to the disk. When the beam is blocked by a write-protect tab or a solid disk jacket, the drive can read from, but not write to, the disk. If you attempt to write to such a disk, you'll receive an error message from the drive.

By leaving a disk unnotched, the manufacturer hopes to keep you from ruining the disk. The disk, in this form, is write-protected. You are prevented not only from deleting existing files from the disk (this requires that you write to the disk directory), but from copying your own files to the disk as well. If you were able to copy files to the disk, you could possibly overwrite the manufacturer's files or a sector containing copy-protection.

If you notch a disk jacket with a paper punch or pair of scissors, you can then write to the disk. But beware of the risks. If you're not careful, you could destroy the contents of the disk either while handling it (data is stored magnetically on the surface of the disk) or by accidentally cutting the disk itself. For these reasons, we don't recommend you notch commercial disks.

Rat-a-Tat-Tat

In the August 1987 *GAZETTE* "Feedback," you published a program for the 128 that sounded like a percussive drum set. Can you provide a 64 version of this program?

Clay Farrow
Santa Fe, NM

The SID (Sound Interface Device) chip, found in both the 64 and the 128, is quite versatile. By manipulating a few bits

within the chip, you can create a wide range of sounds. BASIC on the 128 contains built-in commands that make programming the chip relatively easy. On a 64, this task is somewhat more involved, since it must be done manually with POKEs.

Here is a short program for the 64 that simulates a drum set:

```
XF 10 S=54272:FORX=STOS+24:POK
      EX,0:NEXT
QX 20 POKES+24,79:POKES,100:PO
      KES+1,100:POKES+7,100:PO
      KES+8,100:POKES+14,15
PR 30 POKES+15,0:POKES+5,4:POK
      ES+6,3:POKES+12,5:POKES+
      13,32:POKES+19,0:POKES+2
      0,3
HD 40 POKES+21,7:POKES+22,138:
      POKES+23,2
KD 50 POKES+4,129:GOSUB70:POKE
      S+4,0:POKES+18,129:GOSUB
      70:POKES+18,0:POKES+11,1
      29
FG 60 GOSUB80:POKES+11,0:GOSUB
      80:POKES+18,129:GOSUB70:
      POKES+18,0:GOTO50
CQ 70 GOSUB80
EA 80 FORX=1TO90:NEXT:RETURN
```

Line 10 clears the SID chip. Lines 20 and 30 set the volume, filter type (high-pass), frequencies, and the attack, decay, sustain, and release (ADSR) for all voices. Line 40 sets the filter cutoff frequency and resonance for voice 2.

The actual playing occurs within a loop in lines 50 and 60. These lines select a noise waveform for each voice and then gate it (start the attack/decay/sustain cycle). A delay follows, provided by the subroutine in lines 70 and 80, before each voice is turned off.

Normally, you would ungate the waveform (start the release cycle) rather than turn it off completely as we've done here, since this results in a popping noise. But in this case, the effect actually enhances the percussion sound.

If the sounds generated by this program are not quite what you're looking for, try varying some of the parameters POKEd into the chip. For example, to produce different pitches, alter the values stored in the frequency registers (S and S+1 for voice 1, S+7 and S+8 for voice 2, and S+14 and S+15 for voice 3). Higher numbers give brighter sounds; lower numbers produce duller ones. Changing the length of the delay in line 80 also gives some interesting variances.

Notice that the registers for each voice are offset by seven bytes from the previous voice. For instance, to locate the waveform control register for voice 2, just add 7 to the address of the waveform control register for voice 1, and so on (S+4 for voice 1, S+11 for voice 2, and S+18 for voice 3). The addresses for ADSR and frequency for each voice are set up the same way.

The real key to programming the SID chip lies in bit manipulation. Here's an example. Suppose you want voice 2 to have an attack of 1, a decay of 5, a sustain of 2, and a release of 0. The attack/decay register for voice 2 is at location 54284; the sustain/release register, at 54285. Both registers are split into nybbles, *or groups of four bits, which can hold numbers in the range 0–15. The high nybble (bits 4–7) in the attack/decay register contains the attack value; the low nybble (bits 0–3), the decay value. Similarly, the high nybble in the sustain/release register holds the sustain value; the low nybble, the release value.*

*Before setting these two registers, you must combine the attack/decay and sustain/release values. To determine the value to place in the attack/decay register, multiply the attack rate by 16 and add it to the decay rate (in this case, 1*16+5). Follow the same procedure for the sustain/release register; multiply the sustain level by 16 and add the release length (here, 2*16+0).*

Another important thing to remember when you're working with the SID chip is that all registers in the chip, except for the last four, are write-only. Thus, if you PEEK one of these registers, you get a random number. This makes it virtually impossible to use AND/OR bit-manipulation techniques with the chip. Instead, you must know the exact value to POKE into a register.

Keep in mind that often the best way to get a desired sound using the SID chip is through experimentation. For more on how the chip works, see "Exploring the SID Chip" in the August 1987 issue. ▷

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Shuffling in ML

I am trying to write a machine language routine on my 64 that will randomly shuffle 52 numbers ranging from 1 to 52 for a card game. Can you show me a way to do this?

Jonas G. Barber
Japan

A card-shuffling algorithm that is particularly fast is based on the "paper-in-the-hat" technique. Using this method, you first fill a numeric array with numbers representing each card in the deck. Then you run through the array sequentially, exchanging each number with another randomly chosen number in the array.

This process completely scrambles the array and, at the same time, guarantees that no duplicate numbers exist. The program below shows how to do this in machine language.

There are a couple of techniques worth noting here. First, the routine uses voice 3 of the SID chip to provide a random number. To prepare the chip for random-number generation, the program selects the noise (or random) waveform and assigns it the highest possible frequency. This ensures that the random value returned by the routine will change rapidly as the program executes.

Second, instead of assigning values in the range 1–52 for the cards, we actually use numbers in the range 0–51. This makes the machine language code much more efficient and the scrambled numbers—stored in the table DECK—easier to access.

For the following BASIC loader, we have placed the ML routine at 49152:

```
HC 10 FORI=49152TO49206:READA:
      POKEI,A:X=X+A:NEXT
QR 20 IFX<>7652THENPRINT"DATA
      {SPACE}ERROR.":STOP
BQ 30 SYS49152
DX 40 DATA 169,255,141,15,212,
      169
SF 50 DATA 128,141,18,212,141,
      24
MG 60 DATA 212,160,0,152,153,5
      5
GS 70 DATA 192,200,192,52,208,
      247
EC 80 DATA 136,185,55,192,141,
      54
SK 90 DATA 192,174,27,212,224,
      52
XP 100 DATA 176,249,189,55,192
       ,153
HP 110 DATA 55,192,173,54,192,
       157
PP 120 DATA 55,192,136,16,228,
       96,0
```

When you run this program, it positions the table of scrambled numbers (DECK) at location 49207. Each time you want to scramble this table, just SYS 49152. To examine the table and convert its contents to the range 1–52, enter the following line from BASIC:

```
FOR I=49207 TO 49207+51:PRINT
  PEEK(I)+1,:NEXT I
```

If machine language is not your native tongue, perhaps the BASIC program above will help you understand how the routine works. It emulates the machine language program above but goes one step further—it prints the table of scrambled numbers to the screen. Instead of using voice 3 for random-number generation here, for simplicity, we substitute BASIC's built-in random-number function.

```
SG 10 DIM DECK(51)
PA 20 X=RND(-TI)
DH 30 FOR Y=0 TO 51:DECK(Y)=Y:
      NEXT Y:REM FILL THE ARRA
      Y
SP 40 FOR Y=51 TO 0 STEP -1:RE
      M NOW SCRAMBLE IT
JD 50 TEMP=DECK(Y):X=INT(RND(1
      )*52):DECK(Y)=DECK(X):DE
      CK(X)=TEMP:REM EXCHANGE
HS 60 NEXT Y
KE 70 FOR I=0 TO 51:PRINT DECK
      (I)+1,:NEXT
```

```
;Card shuffling routine
;First, initialize SID voice 3 for random numbers
            LDA   #255          ;Set voice 3 frequency register
            STA   54287         ;(high byte) to maximum.
            LDA   #%10000000
            STA   54290         ;Select noise waveform.
            STA   54296         ;Turn off volume and
                                ;disconnect voice 3 output.
;
            LDY   #0            ;Put 52 numbers (0-51) in DECK.
FILL        TYA
            STA   DECK,Y
            INY
            CPY   #52
            BNE   FILL
;
            DEY                 ;now scramble DECK
SCRAM       LDA   DECK,Y        ;store current card in TEMP
            STA   TEMP
LOOP        LDX   54299         ;randomly choose another card
                                ;in DECK
            CPX   #52           ;keep in range 0-51
            BCS   LOOP
            LDA   DECK,X        ;and store it in current card slot
            STA   DECK,Y
            LDA   TEMP          ;and current card in vacated slot
            STA   DECK,X
            DEY                 ;for next card
            BPL   SCRAM         ;do all 52
            RTS
;
TEMP        .BYTE 0
DECK        *=*+52              ;reserve 52 bytes for cards
```

Better BASIC

I learned to program on another computer, so I was surprised to learn that my Commodore 64 doesn't have an AUTO command which automatically numbers lines as you enter them. It also doesn't have a RENUM command to renumber lines already entered. Now I know why your magazine is full of enhancements to Commodore BASIC. Is there a program which combines all these support routines?

Also, I've experienced problems when trying to resave a program using the same filename. My machine won't complete the save. Is this a quirk of Commodore BASIC, or do I need to make a trip to the repair shop?

Judith Gresham
San Bernardino, CA

A programmer's utility for the 64, featuring a number of enhancements to BASIC, is "MetaBASIC." MetaBASIC, which debuted in the April 1985 issue of GAZETTE, *has both an AUTO and a RENUM command. The AUTO command automatically numbers lines entered from BASIC. The RENUM command renumbers existing lines.*

Since its introduction, MetaBASIC has been upgraded. The most recent version was published in the February 1987 issue (see the "Gazette Back Issues" ad elsewhere in this issue for ordering information). The latest version of the program appears in the 1988 edition of The Best of COMPUTE! and GAZETTE.

With regard to your second question: Commodore machines won't allow you to save a program by the same filename without first deleting (or "scratching") the original version of the program. To simplify this process, the save-and-replace command ("@0:")—designed to let you scratch and save in one step—was added to DOS. Unfortunately, save-and-replace contains a bug in many of the older 1541 and 1571 drives. The bug has been eliminated in ROM upgrades to the 1541 and 1571.

If you use MetaBASIC while programming, you needn't worry about this bug. MetaBASIC's RESAVE command scratches the old version of your program before saving the new one.

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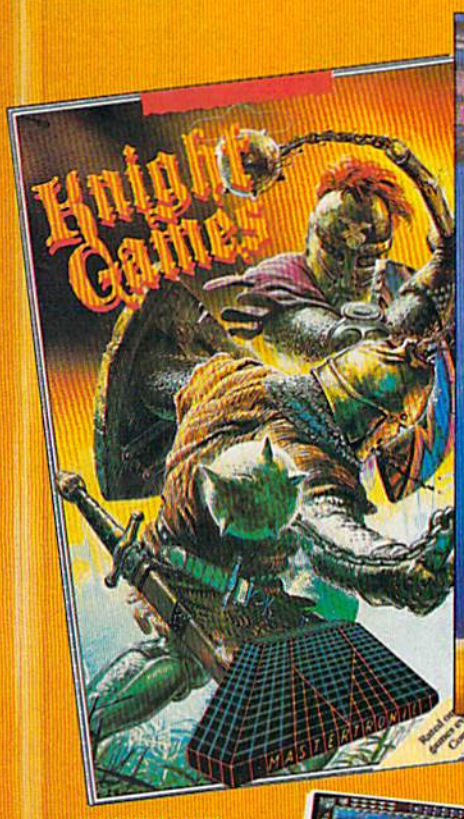

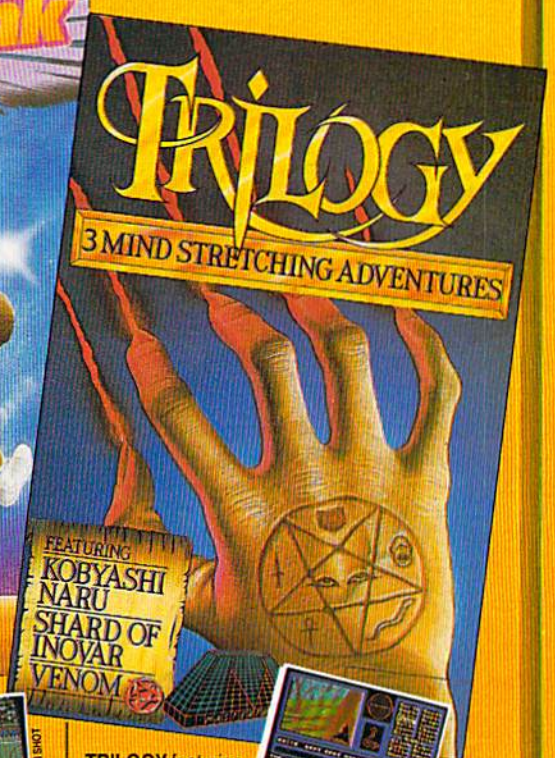

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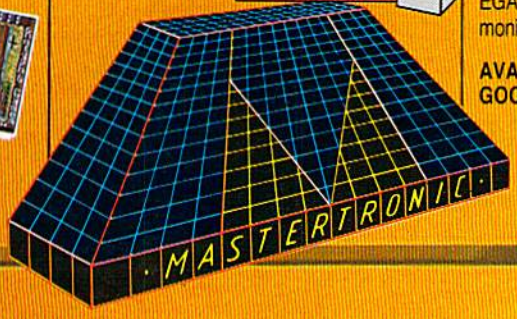

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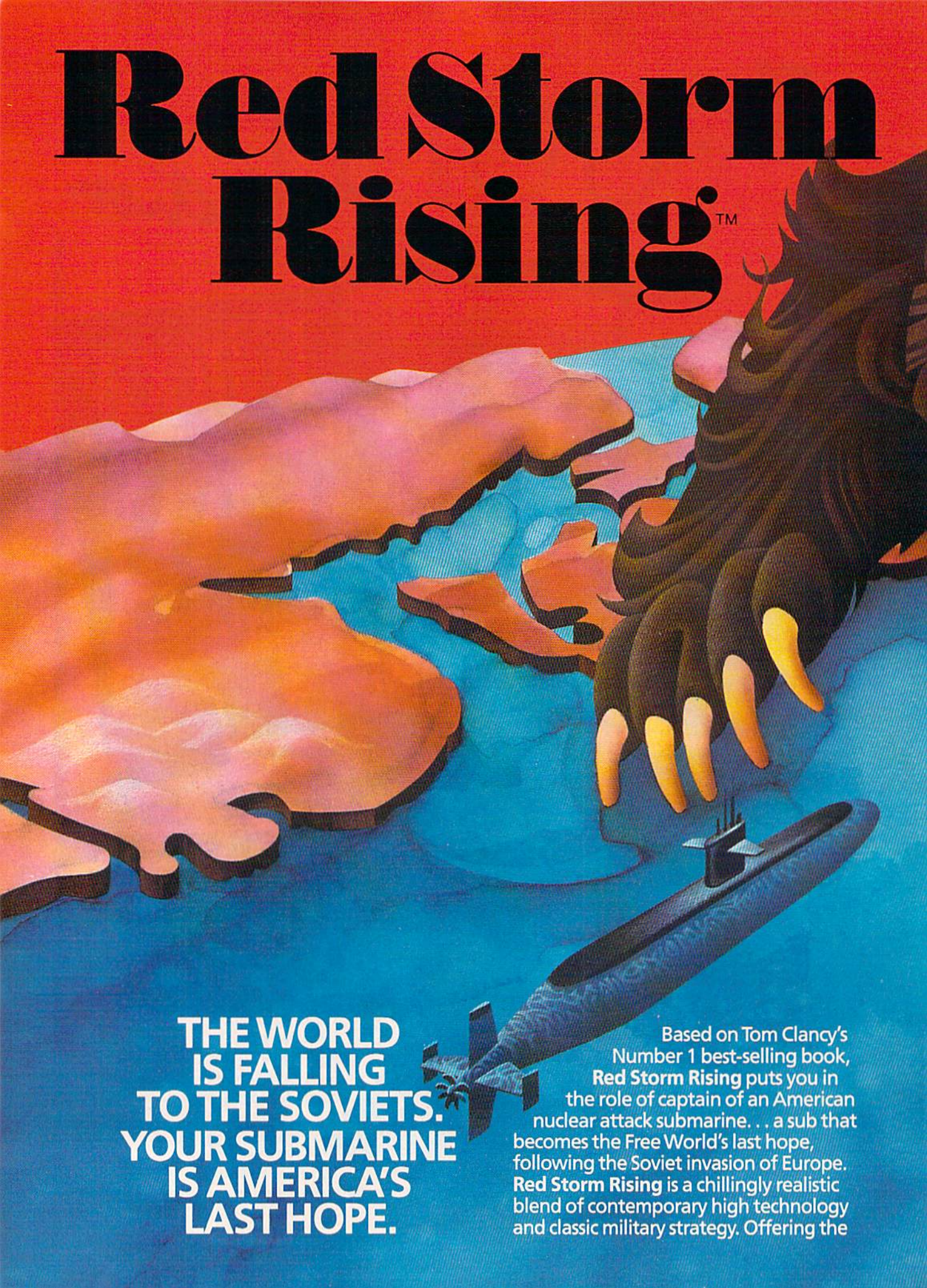

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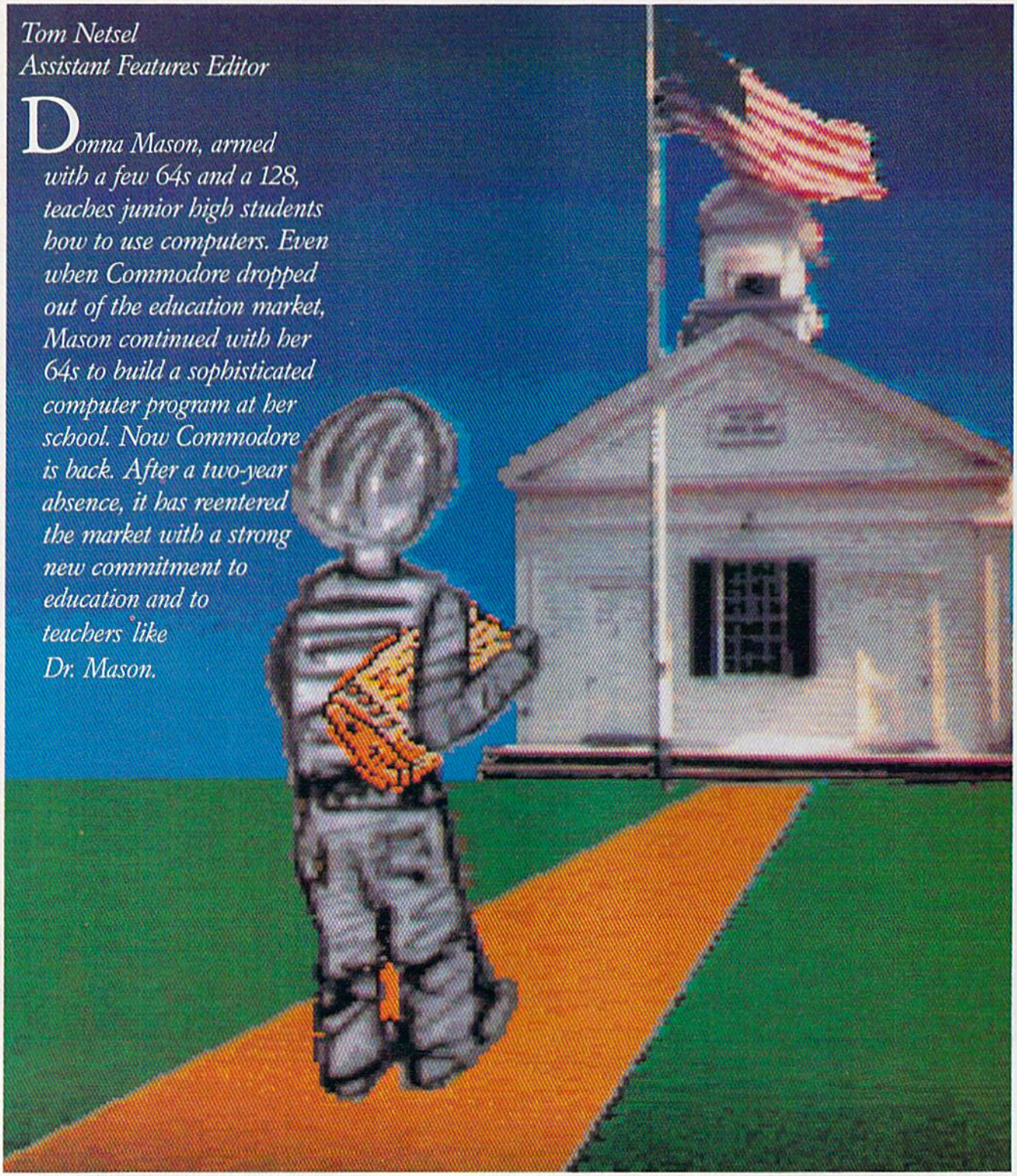
Commodore Goes Back to School

Tom Netsel
Assistant Features Editor

Donna Mason, armed with a few 64s and a 128, teaches junior high students how to use computers. Even when Commodore dropped out of the education market, Mason continued with her 64s to build a sophisticated computer program at her school. Now Commodore is back. After a two-year absence, it has reentered the market with a strong new commitment to education and to teachers like Dr. Mason.



When Mason turned in her doctoral dissertation, everyone assumed she did it with an IBM. They were surprised to learn what she really used.

In 1983, Donna Mason walked into a computer lab at Alice Deal Junior High School in Washington, D.C. She found ten Commodore 64s and little else. There was no software and there were no guidelines for teaching a computer course, yet Mason had the task of setting up a computer literacy program for 1000 students. "I was just told to do it," she says.

At that time, the 64 was a new machine, competing in a market where hardware seemed to outnumber software. There were few games on dealers' shelves, and educational titles were rarer still. "There wasn't too much software available for the 64," Mason says, "so our program consisted of teaching BASIC programming."

In the five years since Commodore first entered the classroom, there have been numerous changes at Commodore and at Deal Junior High. The 64's popularity mushroomed. Software developers embraced the machine and churned out thousands of entertainment and educational titles. But after enjoying an initial success in the classroom, Commodore changed its marketing strategy and dropped out of the education market.

A Learning Tool

Mason changed her strategy as well, but she stuck with Commodore. As Deal's computer laboratory coordinator, Mason steered the computer program in a different direction. Instead of developing students' programming skills, she shifted the emphasis toward integrating the computer into other courses in the school's curriculum. "We really moved away from pure computer literacy, where we taught its history and how a computer works," Mason says, "to just using the computer as a tool. We feel the students are becoming computer literate this way."

Mason uses a team approach at Deal. She and a lab assistant work with other teachers, teaching them how to use the computer in conjunction with other classroom activities. "We do a lot of computer-assisted instruction," Mason says. "We use tutorials, drill-and-practice games, and problem-solving programs."

One popular program she uses is *LogoWriter*, produced by Logo Computer Systems of Canada, which combines a drawing program and a word processor into one package. As students create pictures with Logo, they can write stories about their drawings. "In social studies, for example, if the students are studying the 50 states, they may use Logo to draw the outline of a particular state," says Mason, "then use the word processing capabilities to write facts about that state."

Mason, who recently earned her doctorate in computer education, doesn't rely exclusively on outside programmers to meet her software needs. She worked with other district educators to develop an applications package for the 64. A group of teachers in the Washington school system produced a number of computer activities that complement other courses in a school's curriculum.

Teams of social studies, mathematics, science, and language arts teachers devised ways to incorporate computers into their areas of interest. With the help of computer specialists such as Mason, they came up with a series of computer activities using word processors, spreadsheets, and database managers. They also developed lesson plans, teaching manuals, and student workbooks to accompany the software. The finished project, called *MicroWorks*, was published by the Institute for Scientific Information in Philadelphia. ISI now has similar versions of the program for Apple and IBM.

Limited Budget

Like many schools, Deal is faced with budget limitations. Money for software is in short supply. To buy necessary software, Mason has written a large number of proposals for grant money. These outside sources of income have gone a long way toward funding many of the school's software purchases.

While good software is important, hardware is the other half of the computer-education story. If money for software is in short supply, funds for hardware at Deal have been, at best, very slow in coming. In the past five years, the school has added only four more 64s to its computer lab. For schools with a limited budget, it's easier to buy four 64s than it is to buy four

Commodore officially reentered the education market January 1 with the establishment of an education division.

Apples or four IBMs. When it's important just to get computers into students' hands, the 64's affordability is an important factor for many schools.

Mason uses the 64 in the lab at school, and her dedication to Commodore extends into her private life as well. She owns several computers, but she uses a Commodore 128 more than any of the others. She's also impressed by its capabilities. "I'm a member of a Commodore user group, and I'm always coming into contact with gurus who can make the Commodore sing and dance," she says.

Mason puts her 128 to good use at home and finds it does all she asks of it. As a result, she doesn't plan to upgrade to anything else until she has an absolute need. "I think people just like to have the status of having expensive computers," she says, "but a lot of people can't do anything more with their computers than I can do with my Commodore."

An 80-Column Dissertation

In fact, Mason wrote her doctoral dissertation on her 128. "I really like it, and I'm familiar with the software. I used *PocketWriter,* and I love it," she says.

Mason's dissertation, "Factors That Influence Computer Lab Use in Exemplary Junior High/Middle Schools in the District of Columbia," was 210 pages long, and she printed it on a Brother daisywheel printer. "When I turned in my paper," she says, "everyone assumed I did it with an IBM. When I told them I did it on a Commodore, one person said, 'I always thought of a Commodore as a toy or something for games.' He was really surprised I did it on my 128."

As far as Mason is concerned, the 64 is far from a game machine. It's a tool that she takes very seriously. Other people take her work seriously as well. The United States Office of Education recently awarded Mason a Christa McAuliffe Fellowship for a proposal she submitted, "Operation Sci-Tech: Connecting Science and Technology." In recognizing the importance of computer technology in tomorrow's work force, and therefore its importance to today's students, Mason is working to increase the effectiveness of science instruction through more effective use of technology in instruction. Her proposal also aims at integrating high-tech materials into existing science programs.

The fellowship, named in honor of the teacher who was among seven astronauts killed when the space shuttle *Challenger* exploded, provided Mason with funds to buy computers and other needed equipment for the school's lab. She plans to stick with Commodore and compatible accessories. "I'll be trying to create computer activities that can be incorporated into the existing science curriculum," Mason says. "I'll buy additional computers, robots, probes, and sensors. I hope to stimulate students' problem-solving, creative-thinking skills and really make science more exciting."

Welcome Back, Commodore

Ironically, during the past couple of years, while Mason was improvising with 64s at Deal, Commodore was enjoying worldwide success in the education market—especially in such countries as Canada, Germany, and Australia. (See the accompanying article about Commodore's success in Canada.)

The company's international success was not matched in the United States, largely due to its dropping out of the U.S. education market. But with a user base of more than 7 million 64s and 128s, and with a large number of those machines at work in classrooms, Commodore decided to give U.S. education and teachers like Donna Mason the support they deserve.

"We officially reentered the education market January 1 with the establishment of an education division of Commodore Business Machines in the U.S.," says David Archambault, director of that division. "Over the past six months, we've been trying to get the message out that Commodore is back in the education business."

Getting that message out has kept Archambault and his staff busy this year. They sent letters to the approximately 5000 schools that already own 64s and 128s, announcing that Commodore was back. Commodore informed the schools where they could get service and support for the computers they owned. "We also offered them new education pricing for the first time in

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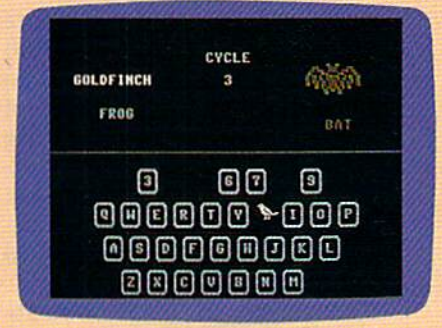

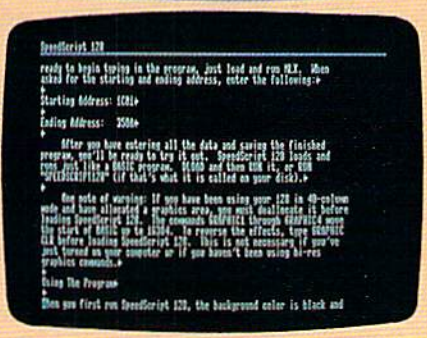

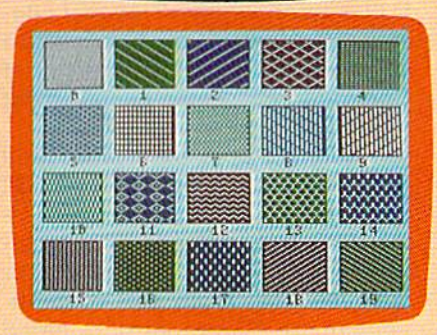

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Commodore offers special price breaks to schools with limited budgets. "They can't afford to buy one Apple IIGS, but they might want to get ten Commodore 64s."

two years," Archambault says.

Increased Support

Commodore hired four education support specialists, technically oriented people who work in each of the company's major U.S. sales districts: Atlanta, Chicago, Los Angeles, and at Commodore headquarters in West Chester, Pennsylvania. These are the people to turn to if a school's local dealer can't help.

Increasing local support is another of Archambault's goals. Commodore wanted to establish a network of at least 150 education dealers across the country. "By the end of June, we had 156 dealers who had at least one staff member dedicated to educational sales and service," Archambault says. Dealers such as Buried Treasure in Rockville, Maryland, provide a full line of services designed to meet a school's needs. When Donna Mason has a question about hardware or software, she turns to Al Menaker or one of the other Buried Treasure staff members for help. "We're the source to come to who will give them total service: prepurchase information and postsale support," Menaker says.

Commodore is adding additional salespeople whose goal is to contact major school districts and universities and make them aware of the company's different machines. Archambault also contributes his personal touch to spreading the news. In the first half of 1988, he attended 14 education trade shows to make Commodore's presence known to educators.

Three-page color advertisements in numerous education and trade publications extol the virtues of Commodore's complete line of computers: the 64 and 128, the MS-DOS machines, and the Amiga. "Each of the key machines is positioned differently to address specific education needs," Archambault says.

The 64 and 128 are aimed at schools that already own several of these machines and want to fill out their line. They are also aimed at schools faced with a limited computer budget, but which still need a substantial number of machines. Alice Deal Junior High School is a typical example. Commodore offers these schools special price breaks on machines. "They can't afford to buy one Apple IIGS," says Archambault, "but they might want to get ten Commodore 64s."

The Best Deal

The 64 remains the most usable machine for teaching basic computer skills, programming, and keyboarding, Archambault says. "It's still by far the best deal as an education computer." The 64 also has a huge library of educational software titles.

"A lot of people say there's none available," says Dr. Ken Brumbaugh, Commodore's K–12 education marketing director. "That's a bunch of baloney!" Brumbaugh, former president of MECC (Minnesota Educational Computer Corporation) spent months compiling a list of educational software for the 64, and found more than 2500 titles currently available. This catalog, which was scheduled for printing this summer, should be available now for teachers, dealers, software developers, and others upon request.

Brumbaugh keeps in touch with about 220 education software publishers. He talks with about 100 of them each month and tries to make personal visits to several of them each week. After heading MECC for several years, Brumbaugh feels he has a sense of what it takes to produce educational software, how to market it, and how to serve clients.

In a further effort to coordinate educational software development, Commodore gathered 30–40 software designers for meetings in Philadelphia and Dallas. Company officials discussed Commodore's plans, discussed opportunities, and asked how they could help the developers. Dr. Henri Rubin, executive vice president and chief operating officer of Commodore International, addressed the group in Dallas at the summer National Educational Computing Conference and reaffirmed the commitment of Commodore's senior management to the U.S. education market.

Joining Apple, IBM, Tandy, and other firms (including COMPUTE! Publications) committed to promoting computer education, Commodore is a sponsor of Computer Learning Month. As part of its involvement, Commodore donated

New educational software titles are appearing on dealers' shelves every month.

about 20 computer systems as prizes for various contests that are part of the month's education activities.

While some educational publishers have abandoned the 64, others continue to support the machine. New educational titles appear on dealers' shelves every month. Subjects cover a wide range of activities. Brøderbund now offers a 64 version of its popular typing tutor, *Type!*. This program shows with graphs how the student is progressing by letter, by keyboard row, by hand, and even by finger.

By Christmas, younger students can expect a 64 version of Britannica Software's award-winning *Designasaurus*. With this popular program, students can select a head, body, and tail from a museum's collection of fossilized dinosaur bones; then they can combine the pieces to create their own dinosaurs and print them in different sizes. Students can even learn to survive like a dinosaur, selecting the right food and avoiding predators and natural disasters.

Tom Paderna, Britannica's product manager, says the 64 is an ideal machine for certain markets. "Not every school district has megabucks," he says. "And frankly, in terms of the heavy uses in schools, sometimes a Commodore is better since it's not as risky an investment. Say a preschool kid spills milk on a Macintosh—then goodbye $3,000."

In addition, not every class needs the raw computing power of the higher-end machines. The 64 is ideal for many applications and for many classrooms. "It's an appropriate machine for the appropriate market," Paderna says.

Commodore: Tops in Canadian Classrooms

Commodore is the number 1 computer in Canadian schools. Apple is running a close second. "We probably have around 21 percent of the market share, and Apple has about 19 percent," says Ray Prachun, one of Commodore Canada's three regional education managers. "The 64 undoubtedly is still the largest seller, but the Amiga is starting to penetrate."

Commodore, founded in 1958 in Toronto, got off to a strong start in Canadian schools when it introduced its first microcomputer, the PET (Personal Electronic Transactor). Most people buying computers at that time were math instructors, school board consultants, and other educators. Those early buyers gave Commodore a strong foothold in the classroom.

Over the years, Commodore continued working with this large installed base of computer owners, providing support, information, and service. As technology improved and the 64 was introduced, educators saw the advantages of that machine and began considering it for their schools. Since teachers were familiar with the Commodore name, and its dealer network already supported their needs, many educators continued buying Commodore products, namely the 64.

"I think it's more to do with the fact that we got started here strong and we worked hard at it," says Doug MacGregor, Commodore's national sales manager in Canada. "Education here is a separate division in the company. People in the education division are all former educators, and our objective is to not only sell computers to schools but also to offer them a total support package."

A Strong Dealer Network

That support rests on a foundation supplied by a strong network of education dealers. Of approximately 300 Commodore dealers in the country, 50 of them are designated as education dealers. These dealers have separate contracts with Commodore, and they must attend in-service workshops designed to help them meet educators' needs. One of those needs is backup hardware. Education dealers must provide a backup when a school's equipment needs repairing.

Education dealers also keep tabs on their local communities, their territory, and their customer/client base. Prachun says regional managers such as himself also visit local school boards, determine their special needs, and feed that information back to the local dealer who services the school account.

What's Hot

Schools often buy hardware and software through their Commodore dealers, but, as in the U.S., teachers may buy from other sources as well. Pilot Software in Oakville, Ontario, sells software to schools as well as to individuals. Pilot markets programs for most computer brands, but Commodore products account for the majority of its sales. "Commodore is about 75 percent of my business," says Pilot's Frank Coates. "IBM's coming up fast, and Apple is staying fairly quiet. Commodore is very big here. Commodore has always been popular in schools, while Apple's always had a poor Candian organization."

Programs currently hot with Canadian educators include titles from U.S. and Canadian producers. According to Coates, DLM in Texas is doing very well in Canadian schools. Its *Create with Garfield! Deluxe Edition* is among the top sellers. Batteries Included, a Canadian firm recently purchased by Electronic Arts, has a number of titles popular in schools, including *PaperClip* and *PaperClip Publisher*. Digital Solutions' *Pocket Writer* is another word processor in frequent use.

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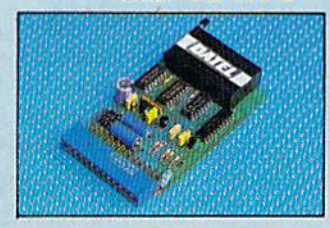

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Buyer's Guide to Preschool Software

Caroline D. Hanlon

To a three-year-old, counting to 10 and learning the alphabet can seem like insurmountable tasks. But with colorful, musical programs, those challenges can be fun as well as educational. This buyer's guide lists programs for the Commodore 64 that are designed for the special needs, talents, and sense of humor of preschoolers.

Alphabet Express
Gamco
$44.95
Railroad graphics and sound help youngsters complete the three activities in this program. In Alphabet Line, players must choose the letter that belongs in the sequence. Upper- and lowercase letters must be matched in the second activity. In Picture/Letter Match, the players must match one of three letters with the correct picture. A program-management system allows teachers and parents to adjust the difficulty level and sound. It can also hold records for 200 students.

Alphabet Zoo
Spinnaker Software
Joystick required
$20.95
Children can develop and improve spelling and vocabulary skills as they make their way through a maze to find letters that fit the picture on the screen. For ages 3–7.

Alphabuild
Fisher-Price
(Distributed by Spinnaker)
Joystick required
$6.95
Alphabuild is a graphics game that helps children develop elementary skills with the alphabet such as matching upper- and lowercase letters, learning alphabetical order, and recognizing simple words.

Animal Hotel
Learning Technologies
$14.95
Students assume the role of the hotel manager. After taking one quick look at room locations of the animal guests, the players will be asked which guest is staying where. The program is designed to develop specific recall and visual memory, visual discrimination, and analysis of the whole.

Astro-Grover
Hi Tech Expressions
$9.99
Children ages 3–6 can try to improve their counting, adding, and subtracting skills with this game. The players help Grover work with numbers in five different ways while they play with the friendly Zips from the planet Zap.

Big Bird's Special Delivery
Hi Tech Expressions
$9.99
Big Bird's Special Delivery is a color-matching game to help children improve their object recognition and classification skills. Players can help Big Bird and Little Bird deliver packages to the right stores. For ages 3–6.

Bike Hike
Learning Technologies
$14.95
Students must recall all the animals and objects they observe while pedaling along the computer bike path. The program helps develop specific recall and visual memory, number recognition and counting, and visual discrimination.

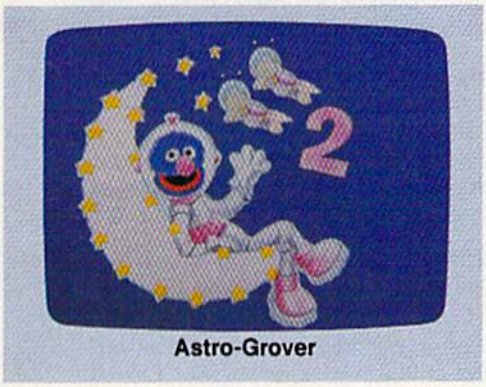
ColorMe: The Computer Coloring Kit
Mindscape
Joystick or KoalaPad required, printer recommended
$34.95
Young children in grades K–5 can draw freehand or color the predrawn pictures with *ColorMe*. With a printer, the pictures can be

printed, and then the child can cut out his or her drawing. Text can be added to the pictures. A *ColorMe Picture Disk* is included with the program. Additional disks featuring Rainbow Brite, Muppet Babies, Shirt Tales, and others are available for $9.95 each.

Counting
MECC
$35.00
Smiley faces, fireworks, Wuzzles, and other color graphics can help preschoolers learn to recognize quantities and numbers from 1 to 20. There are also beginning drills in addition.

Dinosaurs
Advanced Ideas
(Distributed by Banana, CSS, and Soft-Kat)
$39.95
Preschoolers ages 2½–5 can learn about dinosaurs and the prehistoric age with this educational game. Ten different beasts parade across the screen in five matching and sorting games. There are also three games to help generate a happy attitude toward learning. The games incorporate Montessori principles.

Early Games for Young Children
Springboard Software
$34.95
Nine games help children ages 2½–6 learn a variety of skills such as adding and subtracting numbers, drawing, typing with the computer, saying the alphabet, and spelling their names. A picture menu helps children run the program so that no adult supervision is required.



Astro-Grover

Early Learning Friends
Spinnaker Software
Joystick required
$6.95
Alf, Robo-Bird, and Freezy help children learn about shapes, patterns, routing, and planning.

Easy as ABC
Springboard Software
$39.95
Color graphics and animation help children learn the alphabet, including sequence and upper- and lowercase. There are five games—Match Letters, Dot to Dot, Leapfrog, Lunar Letters, and Honey Hunt—accessed by a picture menu.

Ernie's Big Splash
Hi Tech Expressions
$9.99
An animated maze builder, this educational game for ages 3–6 helps students use planning, predicting, and problem-solving skills. Children can explore cause-and-effect relationships with Ernie as they build pathways to help Ernie take Rubber Duckie from the soap dish to the bathtub.

Ernie's Magic Shapes
Hi Tech Expressions
$9.99
In this shape- and color-matching game, children can become magicians, helping Ernie match shapes in six different ways while improving their discrimination skills. For ages 3–6.

The Flying Carpet
Learning Technologies
$14.95
A high-flying genie has created a boat and other objects using triangles, squares, rectangles, and shapes. Students must determine which shapes make up an object. The program is designed to develop shape recognition, matching one-to-one correspondence, counting, size relationships, and figure-ground relationships.

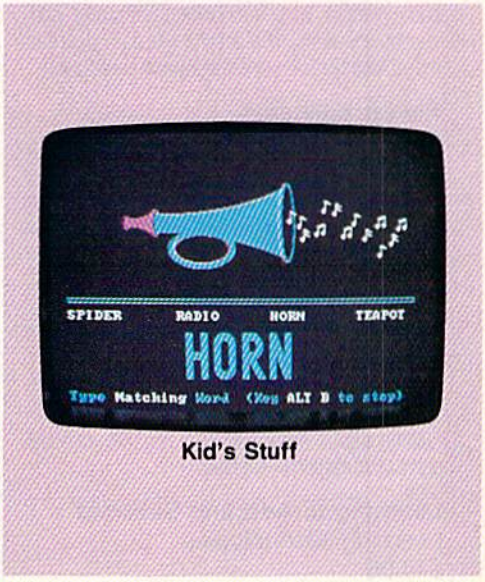
The Friendly Computer
MECC
$45.00
Five programs can help children in preschool through third grade learn about the computer and how to use it. A character called Zebug helps students locate the keys and create computer drawings.

Gertrude's Secrets
The Learning Company
$44.95
Seven games can help children develop basic thinking and problem-solving skills. Along with Gertrude the Goose, the students move color playing pieces to learn about classification, grouping, and sequencing. For grades K–4.

Getting Ready to Read
Society for Visual Education
$299.00
This interactive communication program helps develop both visual and auditory skills for pre-readers. The program includes teacher cards and seven disks that provide practice in visual skills with 48 lessons that increase with difficulty. A teacher's guide and audio tapes that help develop auditory skills are also included.

Getting Ready to Read and Add
Sunburst Communications
$65.00
Primary students can try to identify and match shapes, upper- and lowercase letters, and numbers in this series of programs designed to teach shape discrimination and letter and number recognition. The program can be customized to individual or classroom needs by controlling the selection of numbers and letters. The program operates with either a regular keyboard or Muppet Learning Keys.

Grandma's House
Fisher-Price
(Distributed by Spinnaker)
Joystick required
$6.95
Characters chosen by the players travel over the river and through the woods to Grandma's house. Along the way they can explore special places and pick up things for Grandma.



Kid's Stuff

Grover's Animal Adventures
Hi Tech Expressions
$9.99
With this animated activity, children can learn about the world of animals and natural objects in their native environments by visiting the African grasslands, a North American forest, the Atlantic Ocean, and a North American barnyard. For ages 3–6.

Hodge Podge
Artworx
$9.95
Cartoons, animation, and songs help children ages 18 months to 6 years learn about magnets, numbers, musical notes, animals, and more. An adult can help teach the concepts to the children, or the children can play with the pictures, color, and sound from the program.

How to Weigh an Elephant
Learning Technologies
$14.95
Students must determine the weight of three animals by watching how low the boat floats as

each of them takes a ride. The student can develop concepts of weight, mass, and volume; ordering and sequencing; observation and prediction of outcomes; and cause-and-effect relationships.

Kids on Keys
Spinnaker Software
$20.95
Three games introduce children to the keyboard by helping them learn to recognize letters, numbers, and words from color images appearing on the screen. For ages 4–9.

Kid's Stuff
Stone and Associates
$39.95
Kid's Stuff, for children ages 2–6, helps youngsters practice letter recognition, counting, and vocabulary skills. The program uses a pictorial menu, and the level of difficulty can be adjusted.

Kinder Koncepts
Midwest Software
$99.00
Preschoolers and kindergartners can prepare for math and reading in the elementary levels with this series of programs. The 15-program math series helps youngsters learn to count, compare figures, add, subtract, and relate numerals to numbers of objects. The reading series, which also contains 15 programs, can aid students in matching letters, learning the alphabet, and comparing objects for similarities. The math and reading series each cost $55, or they can be purchased together for $99.

Learning to Add and Subtract
Learning Technologies
$14.95
Students use picture clues to solve simple addition and subtraction problems of single-digit numbers. The program is designed to develop counting and addition and subtraction of single-digit numbers.

Learning Your ABC's with Speech
Covox
$9.95
Children ages 3–6 can learn their ABC's with this program, which offers hints if the wrong answer is given and plays a melody when the right answer is given. The program utilizes speech developed with the Voice Master and *Music Construction Set* from Covox.

Let's Go Fishing
Learning Technologies
$14.95
Students help the fat cat hook just the right number and the right type of fish. The program helps develop recognition of numbers and one-to-one correspondence, and perceptual skills such as shape recognition, visual motor integration, tracking, scanning, and focusing.

Letter-Go-Round
Hi Tech Expressions
$9.99
Beginning readers can learn to match letters and spell simple words with this educational game featuring Sesame Street characters. Three game levels and a two-speed ferris wheel help tailor the game to the skills of the player.

Lion's Workshop
Learning Technologies
$14.95
Students must help the lion match objects in his workshop. Objects move on a conveyor belt and must be paired with objects on his workbench. The program is designed to develop visual-discrimination skills, pattern recognition, and an understanding of part-whole relationships.

Logic Levels
Fisher-Price
(Distributed by Spinnaker)
Joystick required
$6.95
In this maze game, the player tells the Magic Hand where to set the walls, bridges, and springs to guide the ball through the maze. But once the ball starts rolling, everything can change.

Many Ways to Say I Love You

Many Ways to Say I Love You
Mindscape
$29.95
Children can create their own electronic, color greeting cards with this program for prekindergarten through grade 3. The program features music and animated graphics and does not require reading skills. Designed by Fred Rogers of "Mr. Rogers' Neighborhood."

Memory Master
Stone and Associates
$39.95
Four games can help children improve their pattern and shape recognition, develop visual-memory skill, and expand their vocabulary. For ages 2–6.

Muppet Learning Keys

Muppet Learning Keys
Sunburst Communications
$99.00
Muppet Learning Keys is a specially designed keyboard featuring number and letter keys in sequential order plus eight color keys. It also comes with software containing three programs that teach letter, number, picture, and color recognition. The package includes a keyboard, one disk, a backup, and a teacher's guide.

My ABC's
Paperback Software International
$24.95
Six games can assist children ages 3–7 in learning their ABC's and numbers. The games contain music and color graphics. Titles include First Letter, Find a Letter, Letter Pairs, Dancing Letters, Counting, and Hidden Pictures. Music and graphics provide feedback.

My Letters, Numbers and Words
Stone and Associates
$39.95
Graphics, animation, and sound effects help children ages 2–6 learn basic word concepts, the ABC's, and how to count from 1 to 10.

Number Sea Hunt
Gamco
$44.95
Undersea graphics and sound effects help children as they practice number skills. Four lessons can teach youngsters to count, put numbers in the correct order, add, and subtract. Teachers and parents can modify the lessons for individual skill levels. Up to 200 names and scores can be recorded.

Pals Around Town
Hi Tech Expressions
Joystick required
$9.99
In this get-to-know-the-neighborhood activity, children ages 3–6 can learn about the community as they explore five different settings and create scenes with Sesame Street characters. ▷

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1983

July (premier issue)—Word Hunt, Enlivening Programs with Sound, Snake Escape, Skydiver
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September—Telecomputing, Demon Star, Checkbook Reporter, States & Capitals Tutor (V/64)
November—Getting Started with a Disk Drive (Pt. 1), Martian Prisoner, Munchmath, How to Make Custom Characters (V/64)
December—A Survival Guide for Beginners, Getting Started with a Disk Drive (Pt. 2), Space Duel, Bowling Champ, Budget Planner

1984

February—Getting Started with a Disk Drive (Pt. 4), Haunted Mansion, Checkers, Speed Reader, Typing Derby, How to Use Arrays
July—Ultrafont +, Beekeeper, Space Patrol, Robot Math, Downloading, What Is Machine Language?
August—Selecting a Printer Interface, Campaign Manager, Sprite Magic, String Search, Disk Purge
October—The Tomb, Cabby, Quiz Master, Vocab Builder, First Aid, VIC Music Tutor, Turtle Graphics Interpreter
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1985

August—Mixing Text and Hi-Res Graphics, Disk Backup, Code Cruncher, Hi-Res Toolbox
September—MazeMania, Weather Prophet, Printer Wedge, QuickScan
November—Backgammon, Power Poker, Music Maker, Digi-Clock, Exploring 128 BASIC
December—Whirlybird, Dragon's Den, Graphics Construction Set, SpeedCheck, Disk File Archiver

1986

January—Sprint: A Compiler, BASIC Windows, The Fast Assembler, Disk Disassembler, Off-Screen Trace
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June—Solarpix, Quick Key, Fontmaker, Help Screens, 64 AutoBoot Maker
July—Saloon Shootout, Budget Planner, Math Worksheet, Sound Designer 128, CP/M Public Domain Software
August—Address Cataloger, TurboDisk 64, TurboDisk 128, Boldface Print, 128 Sprite Rotator
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October—Pig$ for Buck$, Ringside Karate, Menu System, 128 Sound & Music (Pt. 1)
November—Fill-64, 128 Keywords, 1526 Underliner, Turbo Format, 128 Sound & Music (Pt. 2)
December—Q-Bird, Moon Rescue, The Animals' Show (128), Sprite Locater, Bar Charter, 128 Quicksort, 128 Sound & Music (Pt. 3)

1987

January—Keyword Construction Set, One-Touch Function Key, *GEOS* Icon Changer, CP/M: Surviving with 40 Columns
February—Collision Course, Division Worksheet, MetaBASIC 64, MetaBASIC 128, 128 DOS Wedge, 128 Sound & Music (Pt. 4)
March—Ringside Boxing, Color Craft, 128 RAM Expansion, CP/M RAM Expansion, Sprite Manager
April—Omicron, Music Improvisor, *Print Shop* to *GEOS*, TurboSave 128, TurboSave 64, Countdown Timer
May—*SpeedScript 3.0*, Powerball, Cassette Sleeve Maker, No-SYS Loader, Fast Boot, Gameports
June—Bingo, Fraction Practice, Free-Form Filer, Disk Vacuum, Hi-Res Graphics on the 128
July—Basketball Sam & Ed, Calendar Maker, Crash Prevention, 128 Graph Designer, *GEOS* File Storage, Text Framer
August—Bounty Hunter, Sprite Magic, Sprite Stamp, 80-Column Sector Editor (128) Relative Files
September—Sub Attack, Exercise Pacer, Screen Maker, Impossible Scroll, Video Slide Show, 80-Column Magic
October—*SpeedScript 128*, Chopper Pilot, Stars: A Simulation of the Heavens, Directory Magic, Font Printer, Animator 64
November—Litterbug, Sketch Pad, Poster Printer, Renumber 64, Accessing the 128's 80-Column Screen
December—Crossroads, Snake Pit, Word Find, Animal Match, Disk Rapid Transit, PrintScreen, GeoTrash Restorer

1988

January—How to Buy a Modem, Buyer's Guide to Modems, Needlework Graphics Editor, Tile Paint, Sound Manager
February—Buyer's Guide to Graphics Programs, Easy Load, Turbo *SpeedScript*, Fast 64 Mode for the 128
March—CP/M Software for the 128 (Pt. 1), XPressCard 128, ML Cloner, Big Screen, Color Lister
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May—Networking the 64, Guide to User Groups (Pt. 1), Treasure Diver, MOBMaker, 128 Math Graphics, 1541 Speed & Alignment Tester
June—Buyer's Guide to Printers, Guide to User Groups (Pt. 2), Arcade Volleyball, Excelfont-80 (128), Graphics Wedge
July—Hard Disk Drives for the 64/128, Civil War on Disk, Quick Save, Error Analyzer, SYS Stamper
August—MIDI Made Simple, Buyer's Guide to Music Software, Cribbage (128), 128 Shell Booter, 3-D Sprites, Zoom

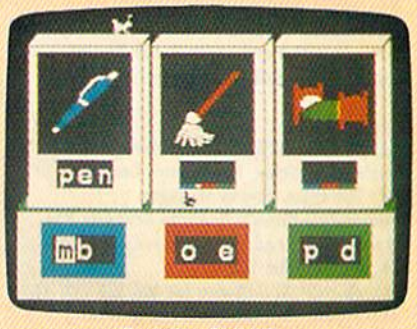
FOR ORDER INFORMATION AND FORM, SEE PAGE 45.

Corresponding monthly disks are available only for issues from January 1986 forward.

Peter Rabbit READING
Fisher-Price
(Distributed by Spinnaker)
Joystick required
$24.95
Peter Rabbit READING can help children ages 3–6 develop fundamental reading skills through a variety of phonetic activities. Topics covered include letter matching, sound and symbol relationships, and the proper use of consonants and vowels. Characters from Beatrix Potter's classic story, *Peter Rabbit*, help guide the students through the program.

Pre-Reading
MECC
$35.00
Graphics such as caterpillars and trains lead youngsters through games and drills to help them improve their concentration, practice the initial sounds of simple words, and recognize upper- and lowercase letters.

Rainbow Painter
Springboard Software
$34.95
A graphics program for children ages 4–10, *Rainbow Painter* contains 50 different brushes and a variety of color patterns so children can create their own drawings or color in one of the 50 prepared line drawings.

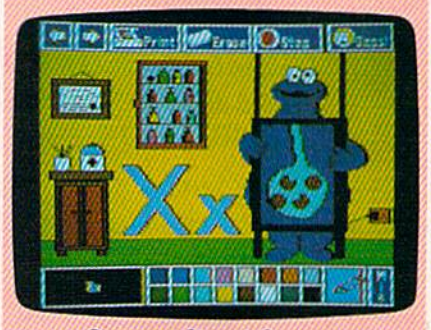


Reader Rabbit

Reader Rabbit
The Learning Company
$39.95
Four animated games can help students ages 4–7 develop fundamental reading, spelling, and thinking skills. Children can improve letter and word recognition, vocabulary, and memory skills.

Richard Scarry's Best Electronic Word Book Ever
Mindscape
$29.95
Six color environments provide the background for a variety of Richard Scarry characters to help youngsters improve word recognition, vocabulary, and word-to-object association. For children prekindergarten through grade 3.

Same or Different
Learning Technologies
$14.95
Students must select either the like object or the unlike object. The program is designed to develop visual discrimination, matching, observation, and deductive reasoning.



Sesame Street Crayon

Sesame Street Crayon
Polarware
$14.95 each
Sesame Street Crayon is a series of computer coloring books for children. Each issue contains dozens of pictures that can be colored over and over. The users can point and click to choose the color, point to the area to color, and then click to fill the area with color. The pictures can also be printed out with a printer and then colored by hand. Titles include Letters for You, Numbers Count, and Opposites Attract. Characters from "Sesame Street" are featured. Each title is sold separately for $14.95.

Sesame Street Learning Library, Volumes 1 and 2
Hi Tech Expressions
$29.95 each
Each volume of the *Sesame Street Learning Library* contains three programs that use Sesame Street characters to help preschoolers learn basic principles. *Volume 1* includes *Ernie's Magic Shapes*, *Big Bird's Special Delivery*, and *Astro-Grover*. *Volume 2* offers *Ernie's Big Splash*, *Grover's Animal Adventures*, and *Pals Around Town*. A 16-page guide is included in each package. Each volume is sold separately for $24.99. Each title is also available separately for $9.99.

Shape Starship
Gamco
$44.95
Four lessons can help students learn to distinguish and match shapes. Spacelike graphics and sound effects accompany the activities. Teachers and parents can customize the lessons to a user's skill level. The program also includes a record-keeping function that holds up to 200 names and scores.

Shutterbug's Patterns
Learning Technologies
$14.95
This program is designed to develop visual discrimination, pattern recognition, and part-whole relationships. The object of the game is for students to help Shutterbug discover which pictures complete a pattern.

Shutterbug's Pictures
Learning Technologies
$14.95
Students are shown two almost identical pictures. The second picture, however, is missing an object. Students must decide what is missing. The program is designed to develop specific recall and visual memory, visual discrimination, and part-whole relationships.

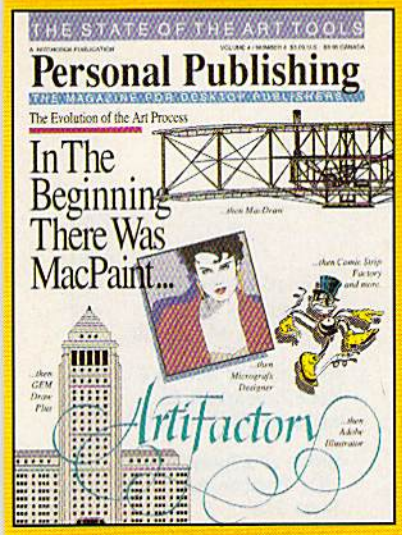
Songs for Kids
Chipmunk Software
$9.95
A menu-driven program for children ages 3–7, *Songs for Kids* is a collection of 25 kids' songs such as "Mary Had a Little Lamb" and "Hickory, Dickory, Dock." The words are displayed on the screen as the music plays.

Spelling and Reading Primer
EduWare
(Distributed by Britannica Software)
$9.95
By matching pictures with words, children ages 4–8 can learn to read and spell. The program includes graphics and sound effects.

Stickers
Springboard Software
$34.95
One hundred sticker pictures in ten categories can help children learn to distinguish shapes. In this program, kids select a sticker shape, color it, and combine it with other shapes to create a sticker picture. Children can also create their own stickers. For ages 4–12.

Stickybear ABC
Weekly Reader Family Software
$29.95
Animated pictures can help children learn the ABC's and become familiar with computers. Each letter is represented by two-color, full-screen pictures and sound. Younger children can learn to recognize and name letters while older ones can begin to recognize words. For ages 3–6.

Stickybear Numbers
Weekly Reader Family Software
$39.95
Children ages 3–6 can learn to count using the groups of trucks, ducks, planes, and more in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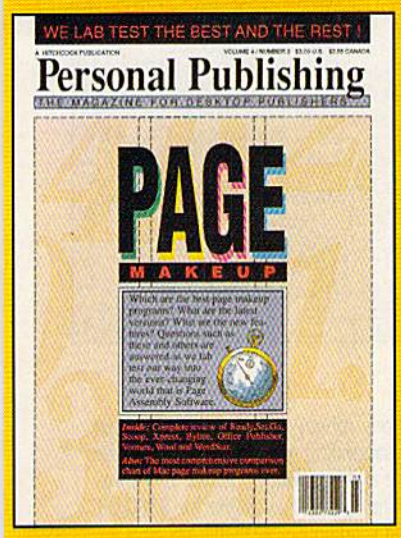

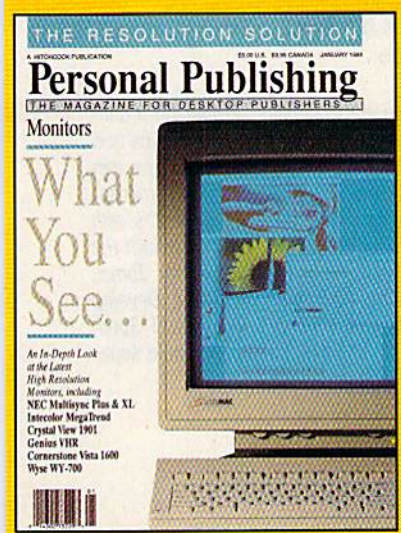

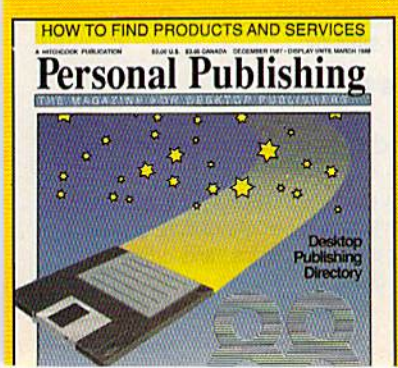

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San Francisco, CA 94107

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Battleground, WA 98604

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Northbrook, IL 60062

Orange Cherry Software
Westchester Ave.
P.O. Box 390
Pound Ridge, NY 10576

Paperback Software International
2830 9th St.
Berkeley, CA 94710

Polarware
1055 Paramount Pkwy.
Suite A
Batavia, IL 60510

Society for Visual Education
1345 Diversey Pkwy.
Chicago, IL 60614-1299

Soft-Kat
16130 Stagg St.
Van Nuys, CA 91406

Spinnaker Software
One Kendall Sq.
Cambridge, MA 02139

Springboard Software
7808 Creekridge Cir.
Minneapolis, MN 55435

Stone and Associates
7910 Ivanhoe Ave.
Suite 319
La Jolla, CA 92037

Sunburst Communications
39 Washington Ave.
Pleasantville, NY 10570

Unicorn Software
2950 E. Flamingo Rd., #B
Las Vegas, NV 89121

Weekly Reader Family Software
Optimum Resource
10 Station Pl.
Norfolk, CT 06058

Stickybear Numbers. There are more than 250 possible color-picture combinations to help reinforce number and counting skills. Youngsters can also learn about computers.

Stickybear Opposites
Weekly Reader Family Software
$29.95

Stickybear appears on unicycles, in cars, on hot-air balloons, and in other vehicles to help explain opposites concepts such as up and down, full or empty, and in front or behind. For ages 3–6.

Stickybear Shapes
Weekly Reader Family Software
$29.95

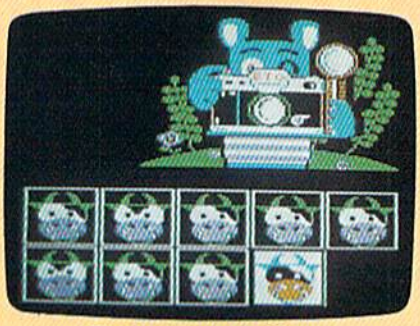
Three full-color games help young learners identify circles, squares, triangles, rectangles, and diamonds. Every correct choice brings a picture to life with animation. Players can choose from three different learning activities. For ages 3–6.

Telling Time
Gamco
$44.95

Students choose from four lessons: Type in the digital time when shown a clock face, type in the time when given the time in words, set the clock hands when given the time in numerals, and set the clock hands when given the time in words. The computer randomly generates questions and gives the correct answer after three errors. Students who score a certain percentage may play an arcade game as a reward. A management system is included for the teacher.

Telling Time
Orange Cherry Software
$39.00

Telling Time can help children learn to tell the time. The two programs cover clock faces, hours, half hours, the minute hand, and the number of minutes in an hour.



Shutterbug's Patterns

Ten Little Robots
Unicorn Software
$49.95

Five different games can help youngsters ages 2–5 learn to use a computer. Little Robot Story is an interactive nursery tale that introduces the concept of subtraction and helps children recognize words, as well. With Count the Robots, the player must count the robots on the screen and enter that number. Players can match upper- and lowercase letters in Robot Letter Match. In Robot Addition, robots appear on the screen with the corresponding number to help children learn to count and add. Robot Sketch is a drawing game. A lab pack is available for $120.00, and a teacher's edition is available for $69.95.

Tink Tonk Series
Mindscape
$9.95

Each program in this series is designed for children ages 4–8 and features color graphics and animation. The activities in the programs can help students learn basic math, spelling, memory, and thinking skills. Titles include *ABC's with the Tink Tonks*, *Being a Smart Thinker with the Tink Tonks*, *Subtraction with the Tink Tonks*, *Count and Add with the Tink Tonks*, *Develop Thinking Skills with the Tink Tonks*, and *Spelling with the Tink Tonks*. Each title is sold separately for $9.95.

Up and Add 'Em
Fisher-Price
(Distributed by Spinnaker)
$6.95

Animated color graphics can help children learn to recognize numbers and quantities. There are four levels of difficulty.

Webster's Numbers
EduWare
(Distributed by Britannica Software)
$9.95

Four activities can help children ages 4–8 learn shape recognition, number recognition, counting skills, spatial relationships, and problem-solving strategies.

Blowup

Blowup is a cartridge with one simple purpose: to capture screen images and print them in a variety of forms. One obvious application might be the enlargement of screen images for making banners.

Blowup supports six types of dot-matrix printers: Commodore 1525, Seikosha, Okimate 10-B/W, Okidata, Prowriter, and Epson. Any printer compatible with these should work. I tested the cartridge with Epson and Okidata printers with similar results.

Blowup is invisible to a running program. Whenever you wish to freeze a frame, a single button causes the cartridge to take control. A single-page menu appears, and the up/down cursor key lets you browse through the options. You then toggle among the choices within the options with the left/right cursor key. In terms of user-friendliness, nothing could be simpler.

The program automatically analyzes the type of screen captured: lo-res text, hi-res standard (*Doodle* format), or hi-res multicolor (Koala format). The program also suggests the corresponding mode for saving the image to disk. Keep in mind that hi-res and lo-res formats cannot be interchanged. A lo-res text display must be saved as a set of character codes. It can't be transformed into standard hi-res *Doodle* format, for example.

Hi-res screens, whether in *Doodle* or Koala format, can be saved and modified by their respective programs. They can then be reloaded, further manipulated by Blowup, and then printed. It would be nice to have this option available for lo-res screens, as well.

There is an additional SAVE option for hi-res screens: a normal mode where only the bitmap of a screen is saved with no color information. This saves disk space and is quite satisfactory when only a straight black-and-white printout is needed. This is frequently the case and often recommended.

The only type of screen that presents a problem is a screen that looks like a hi-res screen but isn't. Some screens are created with defined character sets in lo-res mode. You won't have problems with these screens unless you save them to disk (necessary in lo-res mode) and load them later for modification and printing. Unfortunately, this won't work because the redefined character set isn't saved in lo-res mode. You can work with these images only while the active character set is still in memory. Then everything works fine.

The menu offers a number of modification options. Primary options include rotation, sizing (enlargements), and cropping. The modification options are saved to disk and can be changed later if needed.

Rotation is available in 90-degree increments. Enlargement is independent on both the *x*- and *y*-axes (very important) and comes in unit multiples (no practical limit). Cropping allows any portion of the captured screen to be selected for printing. In hi-res modes, this could theoretically be a single dot; in lo-res mode, a single character.

Blowup is a very useful tool for Commodore graphics enthusiasts.

With hi-res images, function keys allow you to determine how the cursor keys work to create the desired crop box. An action from 1 to 16 pixels is possible. You may find there are just too many crop-box choices to remember, requiring frequent bouts with the manual. The program should have provided onscreen help or, at least, a function-key overlay.

Other noteworthy features include black-and-white or shaded printing; mirror printing; indention of up to 253 pixels; positive/negative imaging; left, right, or center justification; and a choice of whether sprites are printed. If your printer permits greater printing densities, you can specify one of these. You can then compensate with increased sizing.

The manual is clear and concise, but sketchy. For instance, it doesn't compare the different types of captured screen graphics. Instead, you are referred to the *Programmer's Reference Guide*. A simple note explaining that you can't store lo-res screens in hi-res format would have saved me several calls to Interex's technical assistance number.

The cartridge contains one specific bug. It occurs consistently in shade print mode, though never in black-and-white mode. It happens only during a 90-degree rotation when a double *y*-axis magnification is specified. The *y*-axis does not magnify properly—it's half size. One of the many characters used for shading is apparently too large, causing the line to print out of place and too long.

You can compensate for the sizing error by doubling the *y* magnification. Since the black-and-white printing mode is preferable to the shading mode anyway, the problem rarely occurs. The manual recommends black-and-white for both single- and two-color images. I agree; the image is much clearer.

You will also find that positive/negative images are reversed in shade and black-and-white modes. This is less a problem than a quirk in the program, but it could cause an inadvertently reversed printout. This occurred on both the Epson and Okidata printers.

A word of caution: Don't expect too much in terms of fidelity and resolution, particularly in shade mode. You may run into problems when trying to recreate various depths of coloration and when working with varied sizings, especially independent *x*- and *y*-axes. Shading is especially tricky, so expect an occasional miscalculation with a pattern. Though accuracy could be improved, Blowup's algorithms represent a substantial accomplishment.

Interex is committed to improving its product and fixing its few demonstrated problems. Blowup will prove a useful tool in the hands of Commodore graphics enthusiasts.

—Art Hunkins

Interex Computer Products
(formerly Data Share)
2971 S. Madison
Wichita, KS 67216
$59.95

Excel 2001 Disk Drive

The Excel 2001, from Surfside Components International, is a floppy disk drive for the Commodore 64 and 128. The 5¼-inch/360K disk format is identical to that of the 1571 disk drive, which the 2001 operationally mimics. The drive is a welcome addition to the wealth of strong third-party support for Commodore computers. While not filling a void in the Commodore market, the 2001 provides Commodore users with a solid alternative to the 1571.

The drive is housed in an attractive plastic case similar in color to the 1571, 128, and 64C. The drive is significantly smaller than the 1571, which may have the dubious distinction of having the largest footprint of any 5¼-inch drive on the market. The 2001's footprint is 6¾ inches wide × 3 inches high × 10½ inches deep (compare to the 1571's footprint: 8¼ × 3 × 13¾). This smaller size is very handy for people like me who have limited desk space.

The 2001's features will endear it to users. Like the 1571, the 2001 has two serial ports. The twin ports enable the 2001 to daisychain drives and printers. A DIP switch located at the rear of the casing provides for quick change of the drive's device number, a feature sadly lacking on the 1541. The 2001's media locker, which secures the disk in the drive, has a backstop that prevents accidental twisting or overwrenching. Finally, the drive's brushless direct-drive motor helps ensure accurate data storage and retrieval and trouble-free operation. MTBF (mean time between failures) is a terrific 10,000 hours.

The 2001 performed flawlessly in all exercises undertaken for this review. Like the 1571, it has several modes of operation. For the 64 owner (or 128 owner working in 64 mode), the drive acts as a single-sided 1541 drive, although the 64 user can instruct the 2001 to act as a double-sided drive. For the 128 owner, the drive acts as a much faster double-sided drive. Further, the 2001 uses the MFM recording method necessary to read and write in the 128's CP/M mode. This ability also permits the 2001 to be used with certain MS-DOS utilities such as *Big Blue Reader*.

Tests reveal that the 2001 has the same high level of Commodore software compatibility that's available with the 1571. As most 1571 users know, the 1571 can act like a 1541 drive for almost all purposes, but some copy-protection schemes can prevent the 1571 from functioning correctly. This is also true of the 2001. Problems involve early versions of games such as *Skyfox* and *Gemstone Warrior*, and some 64 copy programs in two-drive mode. With copy programs such as *Fast Hack'em* and *Copy II 64/128*, both the 1571 and the 2001 failed to act properly as the destination drive, but functioned correctly as the source drive. I found no software, however, that successfully loaded on the 1571 and failed to load on the 2001.

In terms of reading and writing speed, the 2001's performance rivals the 1571's. Due to the burst mode of operation, both drives are significantly faster in 128 mode than they are on the 64 or in the 128's 64 mode. I did notice, however, a significant difference in the 2001's sound level as compared to the 1571's. The 2001 was surprisingly quiet—even to the point that the operation light often provided the only clue that the 2001 was accessing the disk.

The drive has a separate power supply, which is the main reason for its smaller and slimmer case. The power supply is provided with ample cable to permit the unit to sit on the floor or in a convenient location on your desk. While I thought the separate power supply would eliminate any concern over the drive's overheating, I was surprised to find that the 2001 does get warm after extended use. However, in my use and testing of the drive, I experienced no overheating problems.

The Excel 2001 is a high-quality, solid performer that provides a definite alternative to the 1571. Functionally equivalent to the 1571, the 2001 sells for less and comes with a one-year warranty. Consequently, it deserves careful consideration by any 64 or 128 user in the market for a first or second disk drive. My only reservation is that its targeted competition, the 1571, is itself an excellent disk drive.

—*Scott Thomas*

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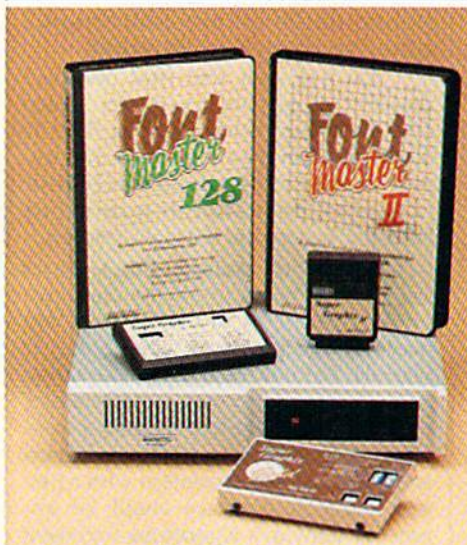

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Jinxter

Of all the luck! Your best friend is missing, your car is involved in an accident with an old woman and a dog-food truck, and you have to take the bus home. Luck has really been on the decline lately. Plagues of bats, mice, and toads are predicted, as well as bad weather for the immediate future. And all this is due to those infernal Green Witches. Where are the Guardians?

This is where you find yourself in *Jinxter*, a graphics/text adventure game written by Magnetic Scrolls and published by Rainbird Software. As in most adventures, you are given a mission. Unlike most adventures, this one requires you to broaden your cultural horizons by becoming familiar with the British vernacular. The authors are British, after all. To make it all the more challenging, the language used is not the proper English we may expect to hear flowing like poetry from the mouth of Sir Laurence Olivier, but the slang-encumbered speech of the common folk, instead: "Werl, piece of cake this. Narmean?"

Everything about *Jinxter* is tongue in cheek. It's filled with Monty Python–style humor. Some of the British satire may zoom right over our Yankee heads, but it's entertaining just the same. Even the copyright message at the beginning of the game does not escape this wit: *Jinxter. Copyright (c) 1987 Magnetic Scrolls LTD. V1.0 and a jolly good version it is too. All rights reserved. We really mean it. No messing.*

The Guardians are a group of shabbily dressed, bombastic magicians charged with the task of protecting the sacred Bracelet of Turani, holder of luck and instrument of domination over Green Witches. Guardians are easily recognized by their herringbone overcoats, and they can usually be found floating around, munching cheese sandwiches. Being very forgetful persons, they refer to just about everything as *wossname* (translates to *what's its name*), but they are dedicated to helping you. That is, of course, if your Guardian doesn't forget and wander off to find the nearest pub.

The magical bracelet consists of charms that have been separated and scattered by Jannedor Nasty and her rebel Green Witches. This separation will bring about the destruction of good luck. It is your task is to reunite these charms, reform the magical bracelet, and rescue your friend Xam. Accomplishing this will bring an end to nasty Jannedor Nasty. Only then can luck be restored and the Guardians returned to their life of leisure and impropriety.

Along with its two disks, *Jinxter* comes with an issue of *The Independent Guardian*, a newspaper for your immortal Guardian friends, subtitled "Quality News for the Hard of Thinking." Reading this tabloid for the first time may have you scratching your head and talking to yourself over its weirdness of topic and strangeness of speech. It is intended for Guardians, after all. You might want to extract what you can on the first reading, then reread it after you have played the game for a while. The newspaper offers you much more help than you may at first realize. Toward the back of the *Independent Guardian* you'll find 4½ pages of encoded clues to help nudge you along when you're stumped. A selection of the game's problems and puzzles are listed, along with cryptic clues that range from just the slightest hint to laying the answer in your lap. I like this feature. It is a unique and effective way to help the lost adventurer—at no extra cost, I

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The game also includes a staff memo from the Department of Guardians, Office of Internal Administrative Liaison from the Deputy Under-Secretary's Assistant General Secretary. Also included is an Old Moosebolter Beer coaster on which to place your pint while you play. The memo is funny, but at the same time it presents story facts you will need once you get inside the game. And the coaster keeps water rings off my desk very nicely.

As with *Guild of Thieves* and *The Pawn*, Magnetic Scrolls has inserted handsome graphics into *Jinxter*. I enjoy the artistry, but these large graphics appropriate too much of my monitor screen, leaving diminutive space for the all-important text. When I switched to the smaller cameo graphics, I found them unclear, indistinguishable blobs of color. The *graphics off* command remedied this and helped speed the game along.

Game instructions are brief. A small card provides loading instructions, graphics/text commands, and an explanation of the save/restore feature. Rainbird encourages the user to make a backup of both disks, and the game disk includes a copy program. No copy-protection? Not exactly. Each time you enter the game, it asks for a certain word from a particular column and line in your *Independent Guardian* newspaper. Once per session, the program randomly polls you for a new word from a different page. No word, no play. The game is useless without the newspaper. All other game instructions and information must be deciphered from a humorous interview (also found in the *Independent Guardian*) with a leading Guardian operative, Len Wossname.

Jinxter is a very challenging adventure game. It will take you on a journey over land, under sea, and on cloud-tops in your quest to harness the bracelet's magical charms. The puzzles are mind-boggling, and the language of the game tests your skills at communicating with our British cousins. All of us Yanks know what a tin opener or a bung is, and I trim my hedges with secaters, don't you?

Jinxter could have you asking Grandma if you, indeed, have any British cousins to consult for advice. You might want to ring them up on the phone thingy and call across the ruddy wossname ocean for some help with this one. Narmean?

—Steve Hedrick

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Now that we've established your identity and your probable interest in the antics of one avis accelera maximus and one canis latrans famishus, let's see if we can get you over to the computer.

Road Runner by Mindscape is your basic arcade game. With a minimum of documentation, you're pretty much on your own. As the Road Runner, you lead Wile E. Coyote on a crazy chase through the desert, using your skills to avoid Wile E.'s sneaky tricks and other pitfalls, such as trains, sand traps, and falling boulders.

Your fuel is birdseed, which you eat on the run. If you miss too many piles of it, you'll slow down and—*oops!*—Wile E.'s got you! On the other hand, if you complete a level without missing any birdseed, you get an extra 10,000 points. Also, if you turn the tables on Wile E. and succeed in destroying him—*beep! beep!*—you get bonus points. Naturally, the higher the level, the more complicated the play.

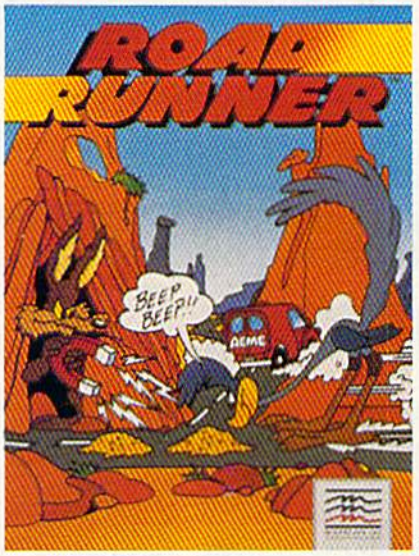
We don't play a lot of arcade games in our family, so we aren't experts. Our Road Runner kept getting caught. But, we did turn to a couple of young experts and asked their opinion.

Road Runner is a slick game that thrusts you right into the action.

They were able to reach the middle level in one evening's session, but getting beyond that was tough. They had a lot of fun with the game and said it reminded them of *Pac-Man*. That's a pretty shrewd comment. With the chasing, mazelike paths, and piles of seed, the game is eat-or-be-eaten, much like its predecessor. And it has the same addictive effect on people . . . so much so that you'll be glad it's not costing you a quarter a shot.

The graphics and music are much better than *Pac-Man*. These characters really are the Road Runner and Wile E. Coyote, right down to their shadows. The desert scenery lacks only a bit of depth and independent motion, but there's enough to convince you it's a clip from the cartoon.

The music at the opening and closing is, naturally, the Looney Tunes theme, produced with a terrific tinny sound. Each level of play has its own theme music. As in the cartoons, the themes are drawn from the classics. The ones we heard included the "William Tell Overture" and the "Flight of the Bumblebee." Apart from the technical sophistication of the music, its sound and tempo have an accelerating—and exhilarating—effect on you while you play. It actually makes you play better.



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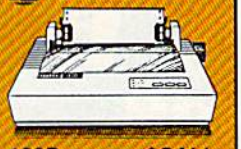

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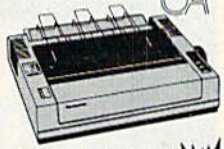

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Drawbacks? There are a few. The program would not work with Fast Load. You can't save scores. In fact, the program appears to save high scores for only about three games in a row. If you play more than that in succession, it starts over.

You also can't save or even pause the game, a frustration for those of us interrupted by recurring household emergencies, telephone calls, or commands to help with homework. This is almost offset by the Shortcut feature. If, after completing Level 1, you lose all your lives and wish to resume playing at your last level, you can take the Shortcut located at the beginning of Level 1. Although you'll miss racking up points this way, you do gain a life and stand a better chance of moving up to higher levels. We have a sneaky feeling this feature is designed to keep you at the computer, because once you turn things off, you've got to work your way up all over again.

The most serious problem we encountered was an inconsistency in scoring when eating piles of seed. However, the ensuing argument, er, discussion, was inconclusive as to who was actually correct, us or the computer. As most of the scoring methods in arcade games are open to question—and derogatory remarks from players—we didn't worry too much about it.

In adapting the story of Road Runner and Wile E. Coyote to an arcade game, Mindscape developed a slick game that builds on familiar characters and lets you get right into the action. Now all we need is a sequel to this program, where you can help Wile E. come up with new ways to catch his bird. In the cartoons, after all, Road Runner always gets away. Sadly, that's not the case in this program.

Oh, well. Back to the game. *Beep-Beep!*

—David & Robin Minnick

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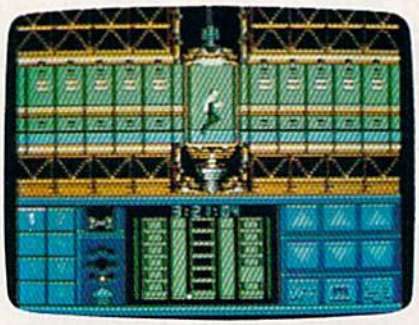
Impossible Mission II

If you're anything like me, probably one of your most difficult problems with school is finding something to do while everybody else is studying for final exams. Consider mastering Epyx's newest impossible mission. This one is better, more realistic than the original *Impossible Mission*, but the action is slower because more is happening on the screen. It's an action/arcade game with good graphics, time and tactical challenges, and fairly realistic animation, if you can accept some exaggerated gymnastics.



Is *Impossible Mission II* impossible? Not exactly. In preparing for this review, I watched someone run the whole game in less than an hour. This may be the result of a balance of luck and a supple wrist (this is a joystick-intensive game), but at the very least, it was the result of days of earnest practice until 3 a.m. No wonder education is in such a state.

In the *IM* scenario, you play the part of a secret agent who's trying to catch supernerd Elvin in his central tower on the grounds of an abandoned V.A. hospital. At the heart of Elvin's complex are nine towers, each composed of rooms heavily populated with robots who never learned Isaac Asimov's three laws of robotics. Elvin has trained his robots to electrocute or otherwise wreak mayhem on any intruder. This belies the friendly digitized admonition at the beginning of the game: "Another visitor! Stay awhile. Stay forever!"

Elvin is threatening the world and he has to be stopped. (What is it about nerds? They're always threatening the world. Something should be done about them.)

You have to search dozens of items found in the rooms—things like freezers, exercycles, sinks, and other items that probably have names, but I couldn't figure out what they were. You search these things by stopping in front of them for a prescribed length of time and pressing the joystick away from you. Lingering is difficult because of patrolling robots.

Some searches yield codes, and some provide access to moving sidewalks and elevators. Approach computer keyboards to control bombs and mines, to turn off the robots for a few seconds, and to locate other boons to secret agentry. Since Elvin presumably is in charge of this madhouse, why would he stash bombs and other dangerous things in a freezer? He must have a subconscious death wish.

There are two kinds of codes you have to find. The first is a series of num-

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bers that allow you access to the next tower. As you search, you occasionally will find some of these numbers. They are automatically fed into your personal computer for comparison against the intertower barriers. The second code you must find is a medley of harpsichord tunes, snippets of which are hidden in safes in the towers. There is one safe in each tower.

After you've collected a few numbers, you'll want to see whether they're the right ones to let you move on. Leave a room and press the fire button. This gives you access to your personal computer and Walkman. Play the cassette player to make sure you don't have duplicate pieces of music. Cycle through the numbers to see whether any of them are correct.

When you have all the right numbers, get a bomb and go for the safe. Place the bomb in front of the safe door. To survive the blast, turn your back or leave the room. After the explosion, search the safe. Then leave the room and make sure you don't have a duplicate piece of music. That fiendish Elvin will stop at nothing to throw you off the trail. He's hidden some bars of harpsichord music in two places, which will foul up the code and bar your access to the central tower.

You can try to gain admission to the central tower by standing in the center of a passage between two other towers and pushing up on the joystick. If you have collected the proper music, you will be admitted instantly.

The central tower has only one room. You have to make your way to three computer consoles at the center of the room and take potluck. Two of the terminals will kill you. Personally, I don't like those odds. However, if you pick the right one, you confront Elvin on the roof of the tower, and he jumps to his death.

But I don't know. People like Elvin have a way of coming back from the dead, especially if the game sells well.

—Robert Bixby

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USER GROUP Update

Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1988 issues.

Send typed additions, corrections, and deletions for this list to

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Attn: Commodore User Groups

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

User Group Notes

The **Pasadena Commodore Computer Club** has changed its address to P.O. Box 40667, Pasadena, California 91104.

The **PD Users of Texas** have a new mailing address. Club correspondence should now be sent to Box 76102, The Colony, Texas 75056.

New Listings

CALIFORNIA

North Bay User's Group (NBUG), P.O. Box 7156, Vallejo, CA 94590

FLORIDA

International C= Network, P.O. Box 1613, Miami, FL 33233

PENNSYLVANIA

Gods of Public Domain, 80 Faith Dr., Catasauqua, PA 18032

SOUTH CAROLINA

Commodore Peek and Poke Society (C.P.P.S.), P.O. Box 71872, Charleston, SC 29415-1872

Rock Hill Area Commodore Club (RHACUG), P.O. Box 10243, Rock Hill, SC 29730

TENNESSEE

Home Town Commodore User Group, Rt. 3 Box 45X, Harriman, TN 37748 or Rt. 1 Box 1415, Wartburg, TN 37887

TEXAS

Central Texas Computer Users Group, P.O. Box 424, Killeen, TX 76540-0424

UTAH

Mountain Computer Society, 3898 Cheryl St., West Valley, UT 84119

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Tidewater Commodore Users Group, P.O. Box 61814, Virginia Beach, VA 23462

WASHINGTON

University Place Commodore Home Users Group (UPCHUG), P.O. Box 11191, Tacoma, WA 98411-1101

WYOMING

Casper Commodore Users Group (CCUG), c/o Crazy Mountain Electronics, 511 E. 2nd St., Casper, WY 82601

The Smalltown 500

Larry Cotton

Last month, I promised that I'd offer help in finding the average speed of each car in our Smalltown 500 race. To do that, we must rewrite the program slightly:

```
10 PRINT CHR$(147)
20 DIM S(4,5),SP(4)
```

Recall that the DIM statement reserves space in the computer's memory—in this case, for the speed data. The first array is two-dimensional (four cars by five laps) and will contain each car's individual lap speed. The second array is reserved for the four cars' five-lap speed totals. This will become clear in a minute.

For purposes of this discussion, we'll assume that all four cars survive five laps. We now need to set up a nested FOR-NEXT loop to read the speeds (which will be in DATA statements) into the computer's memory:

```
30 FOR C=1 TO 4
40 FOR L=1 TO 5
```

The speeds are read with the READ statement:

```
50 READ S(C,L)
```

Let's close the FOR-NEXT loops:

```
60 NEXT L:NEXT C
```

When the program is run, C starts as 1. While C is 1, L increments from 1 to 5. The L loop finishes. C increments to 2. L loops again five times, and so on until C is 4, at which time all 20 speeds have been read into the computer's memory.

Up to this point, our program looks very similar to last month's. But now we must calculate the average speed of each car. This could be done inside the above FOR-NEXT loops, but for clarity we'll create separate loops for the math calculations:

```
70 FOR C=1 TO 4
80 FOR L=1 TO 5
90 SP(C)=SP(C)+S(C,L)
100 NEXT L:NEXT C
```

Here's where the SP(C) array is used. At the end of all this looping, SP(1) will be the sum of the speeds of all five laps of car number 1, SP(2) will be the sum of all five laps of car number 2, and so on.

Average Speeds

We still haven't found the cars' average speeds. Let's do that now with still another FOR-NEXT loop:

```
110 FOR T=1 TO 4
120 PRINT"CAR"T"'S AVERAGE
    SPEED ="SP(T)/5
130 NEXT T
```

We must, of course, have the cars' speed data to read:

```
200 DATA 108,110,122,120,117
210 DATA 118,114,116,114,110
220 DATA 120,123,119,124,125
230 DATA 100,112,115,117,119
```

As mentioned, the two sets of FOR-NEXT loops could be combined into one. Replace lines 60 and 70 with these, and remove lines 80–100:

```
60 SP(C)=SP(C)+S(C,L)
70 NEXT L: NEXT C
```

Another Approach

If all this has been slightly difficult to understand, let's go back and look at arrays in a slightly different light.

Here's the most important concept: Any time you need to use your computer to deal with a number of related items, be they lap speeds in the Smalltown 500 or insects in a collection, array variables should be used to represent the data. That data can come from several sources: input from the user, DATA statements, and so on.

Last month we looked at one- and two-dimensional arrays, which serve most purposes quite well. But you should be aware that most versions of BASIC support arrays (at least theoretically) with a maximum of 255 dimensions. The maximum number of elements allowed in each dimension is 32,767. Rarely, however, will you need arrays of more than 2 or 3 dimensions.

Here's an illustration which may help make the concept of arrays clearer:

```
10 PRINT CHR$(147)
20 ROW=5: COLUMN=7
30 DIM X(ROW, COLUMN)
40 X(3,4)=21
50 FOR J=1 TO ROW
60 FOR K=1 TO COLUMN
70 PRINT X(J,K);: NEXT K
80 PRINT
90 NEXT J
```

If you enter and run this program, you'll see a graphic display (on your TV or monitor screen) of the contents of the 35 allocated memory locations—X(1,1) through X(5,7). All will be 0 except the one that was given a value of 21 in line 30. It will be printed in the third row of the fourth column.

Line 20 defines two constants, ROW and COLUMN, which become the size limits of our two-dimensional array. They can be changed to any values for which the computer has sufficient memory.

Borrowing an analogy from last month, we have a grid of five by seven pigeonholes. Line 30 dimensions the array of 35 elements. Line 40 assigns a value of 21 to one particular pigeonhole in the third row of the fourth column. Lines 50–90 contain nested FOR-NEXT loops which print the array as a 5 × 7 grid.

Numeric vs. String Arrays

This example uses numeric-variable arrays; the lack of the $ character indicates that. As numeric variables, the values that are stored in the slots can be mathematically manipulated, as they were in our speed-averaging example.

But if you expect the computer to handle a lot of letters or names (not numbers), you must use a string-variable array, which is

denoted by the $ character. Here's a modification of the above program which does just that:

```
10 PRINT CHR$(147)
20 ROW=2: COLUMN=13
30 DIM LTR$(ROW, COLUMN)
40 FOR J=1 TO ROW
50 FOR K=1 TO COLUMN
60 READ LTR$(ROW,COLUMN)
70 PRINT LTR$(ROW,COLUMN)"    ";
80 NEXT K
90 PRINT
100 NEXT J
110 DATA A,B,C,D,E,F,G,H,I,J,K,L,M
120 DATA N,O,P,Q,R,S,T,U,V,W,X,Y,Z
```

Memory Requirements for Arrays

To conserve memory in long BASIC programs, you should dimension any arrays (single- or multidimensional) only to the maximum number of elements you expect the program to use. If the user will be entering data and you don't know how many entries to expect, you can ask him or her to furnish this number:

```
10 PRINT CHR$(147)
20 PRINT " DO YOU KNOW HOW
   MANY": PRINT" ENTRIES YOU
   WILL MAKE?
30 GET R$:IF R$<>"Y" THEN IF
   R$<>"N" THEN 30
40 IF R$="Y" THEN PRINT
   CHR$(17);:INPUT "HOW MANY";X:
   DIMA$(X): GOTO 60
50 DIMA$(1000)
60 PRINT CHR$(17)"DIMENSIONED
   TO"X"ELEMENTS
```

Run the program and try different responses to the questions. When the user knows how many entries will be made, A$(X) will be automatically dimensioned to that size. (On a Commodore 64, the actual maximum number of elements this short program can be dimensioned to is 12,898.)

If the user types an *N*, this array will be dimensioned to 1000. You, the programmer, should choose a number that you know will be at least as great as—but, to avoid wasting memory, no greater than—the number of entries the user will make. To make sure that the computer has room for that number of entries, you need to know how much memory is available for the arrays and how much memory the array variables use.

To determine how much memory is free on a 64, type (in the immediate mode)

```
PRINT FRE(0)-(FRE(0)<0)*65536
```

On a Commodore 128, type

```
PRINT FRE(0)
```

to see the number of free bytes for BASIC programs. Or type

```
PRINT FRE(1)
```

to see the number of free bytes for BASIC variable storage.

FRE is a BASIC function that returns the number of available bytes in memory. It's usually used in immediate mode but can be used within a program. Sometimes the execution of FRE is very time-consuming.

Any variable (or constant) takes up a certain amount of the computer's memory, whether or not it's an array variable. The *Programmer's Reference Guide* for the 128 explains very clearly how much memory each type of array requires:

```
  5 bytes for the array name
+ 2 bytes for each dimension
+ at least 2 bytes for each element
```

We haven't studied the type of variables that use the least amount of memory—integer variables. These simply represent whole numbers. Integer variables must be identified by a percent sign, such as A%(3). The DIM statement could look like this:

```
100 DIM A%(X)
```

X should be whatever number of elements you decide to use as the maximum.

If you identify the array variable without the percent sign, as in A(3), add three more bytes for each element. This is called a *floating-point variable* because the number it represents contains a decimal and as many as nine digits following it.

If you identify the array variable as a string, such as A$(3), each element will require three bytes (not three additional bytes—just three bytes) plus one byte per character in each string element.

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machine language programming

All About Numbers

Jim Butterfield
Contributing Editor

I was recently asked whether a computer stores its numbers in decimal or hexadecimal. The answer is neither.

Computers do not know hexadecimal. They store things in binary. Hex notation exists for humans to make binary values more compact and easier to read.

Computers also do not know decimal numbers. They come closest to handling such numbers when they process ASCII strings that represent numbers. When you enter a value like 165 into your computer, you're really entering characters: first the character 1, then the character 6, and then the character 5.

If the computer always stored numbers as ASCII characters, it would have a lot of trouble doing math. So there are other ways of storing numbers. The number 165, for example, can be stored in binary in one byte instead of three (binary 10100101 or hexadecimal A5). In this case, binary gives a space savings of 3 : 1, and calculations will be appropriately faster.

We know and understand that 165 means one 100, six 10s, and five 1s. To the computer, binary 10100101 means one 128, one 32, one 4, and one 1, for a total of 165. And in hex, we could say it's ten 16s (hex A stands for 10) and five 1s to represent value 165.

But how do we get those three ASCII characters (1, 6, and 5) to change to the binary value? Later, when we want to print a number, how do we convert the binary value back to a decimal number we can print? It's hard to see 165 when you're looking at binary 10100101.

From Base to Base

Let's take the first question. If you have entered several digits as ASCII characters, how do you change them to binary? It's not hard once you get used to it. Here's the procedure:

Step 1. Set the variable which will hold the binary value to 0.

Step 2. Are there any ASCII characters left? (Since there will always be at least one ASCII character, the answer to this question is always *yes* the first time around.) If not, we are finished, and the binary number is correct.

Step 3. Multiply the current binary value by 10.

Step 4. Add the value of the next ASCII character to the binary number. (Note that ASCII digit 1 is represented as value 49, so we must subtract 48.)

Step 5. Go back to step 2.

Let's translate our ASCII 165 into binary. We start with step 1 and set the variable to 0.

Are there any characters left? Sure, all three of them. So multiply the binary value by 10 (10 times 0 gives 0); then add in 1, the value of the first ASCII character, giving 1. There are still two characters left when we go back to step 2.

Multiply the binary value of 1 by 10, giving 10, and add the 6—the value of the second ASCII character—to get 16. (Can you see the 165 coming up?)

One character left. Multiply the 16 by 10, add in the 5, and we get our final value of 165, stored in binary. We've changed the character string "165" into the binary value 10100101.

A Real Program

Here's some quick code to show it all working. We'll store characters 165 (followed by a RETURN) into address $2030 and expect to see the one-byte result in address $2040. Here goes, with limited explanations and comments:

```
>2030 31 36 35 0D 00 00 00 00:...
; step 1
2000    LDA   #$00
2002    STA   $2040
2005    LDX   #$00
; step 2
2007    LDA   $2030,X
200A    INX
200B    CMP   #$30
200D    BCC   $2025
; step 3
200F    AND   #$0F      ;to binary
200F    STA   $2041     ;and store
2014    LDA   $2040     ;binary
2017    ASL             ;times 2
2018    ASL             ;times 4
2019    ADC   $2040     ;times 5
201C    ASL             ;times 10
; step 4
201D    ADC   $2041
2020    STA   $2040
; step 5
2023    BCC   $2007
; exit
2025    BRK
```

This program breaks to the machine language monitor when it has finished doing its job. This is not typical, but it lets us easily inspect the result area (address 2040) and see that the value has been correctly calculated. We can also see the final character, stripped to its binary value, in location 2041; it will be a 5, of course.

There are a number of shortcuts in the code shown above. To change a numeric ASCII character to its binary equivalent, we could subtract decimal 48. But it's quicker to use AND #$0F and strip off the unwanted ASCII bits.

Multiplying by 10 uses the ASL (Arithmetic Shift Left) command to multiply by 2. Do it twice, and we multiply by 4. Add the original value, and we've multiplied by 5. One final ASL, and we have completed the trick.

We've been assuming that the result will fit within a single byte. It's better to add tests to confirm that—you never know what a user might type. If you anticipate higher numbers, you'll need more than one byte to hold the binary value, but the principles are the same.

the programmer's page

Randy Thompson
Contributing Editor

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

Commodore disk drives are complex beasts. They have their own microprocessors, their own RAM, and their own ROM-based operating systems. They are, in effect, self-contained microcomputers. I dare say there is as much to learn about Commodore disk drives as there is to learn about the computers that use them.

Recently, I've received several tips for using Commodore DOS. These tips cover everything from manipulating disk directories to read-protecting your BASIC programs.

DOS Gone Wild

These next few hints come from Bernhardt Sandler in Venice, California. He explains how to use DOS's wildcard characters (* and ?) to make directory listings more selective. For example, to get a directory that contains program files only, enter the commands

```
LOAD "$0:*=P",8
LIST
```

By replacing the *P* with an *S*, an *R*, or a *U*, you can limit your directory listings to Sequential, Relative, or User files.

If you'd like to find a specific file, but you can't remember the entire filename, use the commands

```
LOAD "$0:partial filename*",8
LIST
```

This example lists all the files that begin with *partial filename*. Whenever you follow a filename with an asterisk (*), you're telling DOS that you want to find all the files that start with that name. Characters that follow the asterisk are ignored.

Another wildcard, the question mark (?), can be used to specify a particular number of unknown characters. Wherever a question mark appears in a filename, the corresponding character in the filename on disk isn't checked. For example

```
LOAD "$0:P?T",8
```

would find the files PIT, PAT, and PXT, but not PHIT, SPAT, or PXTZ.

How about combining the wildcards? The command

```
LOAD "$0:???WOR*",8
```

locates any filename with *W*, *O*, and *R* as its fourth, fifth, and sixth characters.

Free Blocks

In the March 1987 issue, our "Feedback" column listed a short four-line program that finds the number of blocks free on a disk. Fred W. Travers of San Leandro, California, wrote in to show us an easier method:

```
LOAD "$0:",8
LIST
```

Entering these two commands from immediate mode reveals the disk's name, ID, and number of blocks free.

Loading ML Files

Francis O. Saffell from Eugene, Oregon, has a tip for 64 programmers who use machine language disk files in their BASIC programs.

Normally, if you load a file from within a BASIC program, that program reruns itself. You can avoid this iterative effect by replacing all your LOAD *"filename"*,8,1 commands with the following code:

```
OPEN 1,8,1,"filename":POKE 780,0:SYS
  65493:CLOSE 1
```

where *filename* is the name of the machine language file.

When you use this load routine, BASIC continues program execution at the next program line. This trick works on the 128, Plus/4, and 16, but it's easier to use the BLOAD command that all three of these computers provide.

Read Protection

If you want to read-protect your BASIC programs (make them unloadable by BASIC), Richard Reano of San Diego, California, has a suggestion: Save your programs as sequential files, or, better yet, save them as user files. Try

```
SAVE "filename,S",8
```

to save your program as a sequential file, or

```
SAVE "filename,U",8
```

to save it as a user file (note the use of the *S* and *U*).

Now, when you list the disk directory, you'll find that your PRG file has become a SEQ or USR file. And if you try to load the SEQ or USR file, BASIC reacts with a FILE TYPE MISMATCH error.

Actually, there *is* a way to load these modified files, but you have to know the secret. To load one of these files, use the same ,S or ,U that you used when you saved the program. For example, to load a BASIC program saved with SAVE *"filename,S"*,8, use LOAD *"filename,S"*,8.

Multiple Scratch

This last tip is my own. It allows you to scratch up to five files with just one command. The syntax for the multiple scratch is

```
OPEN 15,8,15,"S0:filename1,filename2,
filename3,filename4,filename5":CLOSE 15
```

If you prefer, you can use this method to scratch only two, three, or four files—just be sure to separate each filename with a comma. If you include a sixth filename, DOS will ignore it.

Isaac Asimov: Teacher for a Day

Fred D'Ignazio
Contributing Editor

What would it be like if you could pick anyone in the world to be your teacher? I experienced an opportunity like this recently, and it opened my eyes to the ways technology can make classroom walls disappear, reduce distance to a state of mind, and transform learning as we know it today.

The occasion was the first Software Challenge, hosted by the Technology Center of Silicon Valley and held at the headquarters of P-CAD (Personal Computer-Aided Design Systems) in San Jose, California. The Technology Center is a new organization founded by the high-tech pioneers of Silicon Valley, including William Hewlett, David Packard, Steve Wozniak and Del Yocam of Apple, and Robert Noyce of Intel. The center's mission is to create a series of innovative programs that will train teachers in high tech and reach out to high school students to get them interested in high-tech careers.

Spaghetti Noodles and Mars Rovers

In the first event, the Tech Center challenged 40 high school students to build a cantilevered bridge in less than 15 minutes using only Scotch tape and spaghetti noodles. Next the Center sponsored a Technology Challenge in which the students had to build a machine that would, like NASA's Mars Rover, be able to move across uneven terrain.

The third event of the season was the Software Challenge. On the morning of the Challenge, the 40 high school students showed up, disks in hand, ready to tackle *Robot Odyssey*, a program from The Learning Company.

Telepresence in the Classroom

After the Challenge, the students jumped on a yellow school bus and rode it to Compression Labs, another Technology Center sponsor, for a barbecue atop the company's second-floor, open-air balcony. When they had finished lunch, they filed into a small, white classroom and sat down. At the front of the classroom were two TV screens—one large screen and one enormous, rear-projection screen. The students could see themselves on the large screen.

As I watched Asimov and listened to him speak, I realized that this was a miracle unfolding. Asimov could see and hear us, and we could see and hear him. Live. In realtime. From three thousand miles away.

On the huge screen, in full motion and living color, sat Isaac Asimov. *The* Isaac Asimov who has written 391 books, who coined the word *robotics*, and who is the author of *The Foundation Trilogy*, the most popular science-fiction trilogy of all time. For the next hour and a half, Isaac Asimov was the students' teacher, piped in over a U.S. Sprint phone line from a studio in New York City, three thousand miles away.

Scientists at MIT's Media Lab talk about *telepresence*, but this was the first time I'd seen it in action. Asimov could see and hear us, and we could see and hear him. Live. In realtime. After only a few moments, the distance that separated us became less real than Asimov's obvious presence in our classroom. He laughed with us, told jokes, spun yarns about the distant future, and bewitched us with his stories about robots, artificial intelligence, learning, computers, and the human brain.

As I watched him and listened to him speak, I realized that this was a miracle unfolding. Here was a master teacher who could hold the 40 bright high school students in the room spellbound during a 35-minute lecture. Then the students got up from their chairs, one at a time, and, a bit shyly at first, began interacting with him, asking questions, debating points in his lecture, inquiring about characters, robots, and galaxies he had invented in his novels.

The cameras zoomed in on Asimov and the student, and their images filled the screens. It was as if they sat opposite each other at a kitchen table, engaged in a private and intimate conversation. The rest of us sat spellbound and hushed, vicariously participating in that conversation.

And then the moment was over. Asimov said goodbye to us all. The screens went blank. The students, in good spirits, laughing and jostling each other, filed from the room.

Classrooms Without Walls

What had happened? I think something unique. In that brief experience I saw education transformed. Bright young minds in any classroom on earth could reach out and link up with the best teachers on our planet—explorers, scientists, humanitarians, business leaders, artists, musicians.

All could be carried into the classroom for a few minutes. All would leave the classroom informed and inspired. All lives would be irrevocably touched. The classroom need not be cut off and insulated against the real world. Distance, indeed, is only a state of mind.

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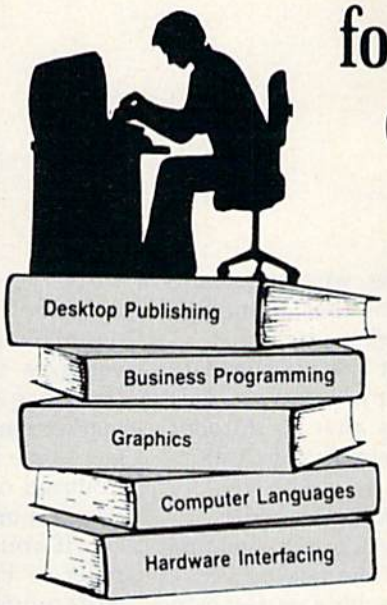

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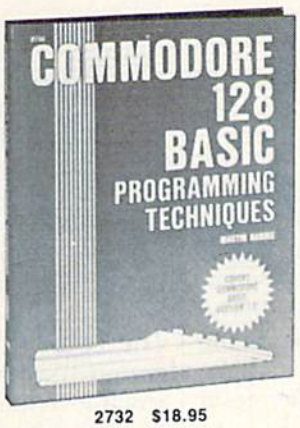

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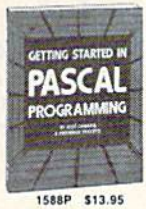

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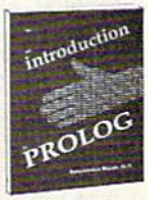

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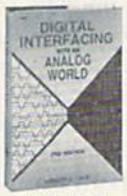

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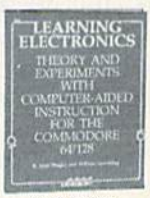

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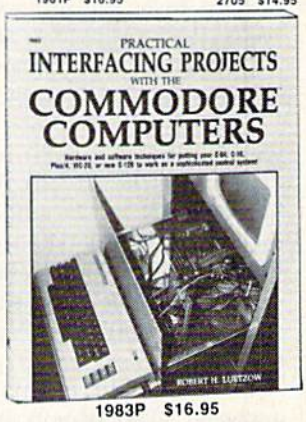

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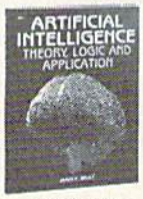

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horizons

Rhett Anderson
Assistant Editor

This column is called "Horizons." The name comes indirectly from the Greek word *kyklos*, meaning a bounding circle (*bounding* as in *encompassing*, not as in *leaping*). The horizon bounds the earth from the sky. In an abstract sense, it is the line which divides the known from the unknown.

Looking into the future is not a simple task. This month, "Horizons" lives up to its name, standing at the border that separates the known present from the unknown future. We'll take a small look ahead to see what's in store for you and your fellow Commodore computer users.

We learned something about your future (and ours) when many of you answered our Readership Survey back in December. Among the questions we asked were: " Do you plan to purchase another computer within the next year?" and "If so, which computer do you plan to buy?"

We learned much from your answers. Most of you are satisfied with the computer you have (presumably a 64, 128, 16, or Plus/4). Of those of you who are planning an upgrade, about a third want a 128, another third want a PC or compatible computer, and the remaining third want an Amiga.

I'll Keep Mine

It's not surprising that most of you want to hold on to the computer you have. Commodore 8-bit computers are a bargain in a world of bargains. Software for your computer is plentiful. Because of the popularity of these venerable machines, you probably have at least a few friends with whom you can trade tips.

There's a lot you can do with your 64. It has its own windowing operating system *(GEOS)*, its own online network (QuantumLink), and all the games, word processors, and spreadsheets that a computer lover could need.

The 64 set the standard for computer graphics and music. Now, five years after its introduction, it's still a strong competitor.

The Logical Step

If you like the Commodore 64, you'll love the Commodore 128. In emulation mode, it's a perfect clone of the 64, able to work with any of the software and hardware developed for the 64. In native mode, it's the 64's big brother. It fully supports a faster disk drive (the 1571), an 80-column screen, and 128K of RAM. In CP/M mode, it runs programs for the once-popular CP/M operating system.

With all of its modes, the 128 is certainly one of the strangest computers ever made (call it the duck-billed platypus of the computer world). It's also one of the most popular—about 2 million have been sold.

Commodore recently discontinued the standard 128. But they still produce the 128D, which features a detachable keyboard, built-in disk drive, and extra video RAM. It's an attractive package, but it raises the base price of the machine into the range occupied by PC clones and Amiga 500s. Even so, many of our readers will recognize the 128D for the bargain it is.

A Different World

It's nice to be compatible. Ask the millions of people who own VHS-format VCRs. They can go to any video shop and choose from hundreds or thousands of videotapes.

It's nice to be compatible in the computer world. And few people would argue that the IBM PC is the standard personal computer. To buy a PC compatible is to buy into a worldwide network of users.

If you have a PC compatible at work, you might be tempted to have one at home. If you don't have one at work, there are still many advantages to owning a clone. The immense size of the compatible market means a lot of software. In fact, some games are now being introduced on the PC before they're released on the 64.

If you bought your first computer to balance your checkbook, write a novel, or use a spreadsheet, heavy-hitting software like *dBase*, *WordPerfect*, and *Lotus 1-2-3* can be tempting. However, if you want great graphics and sound, be prepared to spend some money for add-on boards.

And Yet Another

If you bought your first Commodore computer for its graphics, animation, sound, and musical virtuosity, the Amiga can make your mouth water. And if you like computer games, the Amiga is the standard. In fact, arcade machines are being built around the Amiga's custom chips.

The Amiga is being used for desktop video. It supports genlocking (that means you can overlay computer graphics on an external video source), and its interlaced video output records cleanly onto videotape.

The Amiga has a powerful multitasking operating system. You can run many programs, all at the same time.

The Tea Leaves

If you responded to our survey, you may have read your future in the paragraphs above. If we missed the mark entirely, write us and let us know what *you* think your future really is.

Next Month:

A Pirate Gets The Last Word (Almost)

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2400's are great (but quite expensive). Most users can't justify the cost difference unless they do a large amount of modem work with a service that can handle 2400 baud.

You will also notice a few very cheap 1200s on the market at "too good to be true prices." They are. The reason is that they are usually foreign built and not truly Hayes® and Commodore 1670® compatible therefore not usable in all situations and with all services.

What is Hayes® compatibility? It's the industry standard and about all modem manufacturers have adopted the "AT" (Hayes) command set. Beware of those who don't. Virtually all software being written now uses Hayes commands. Be sure the modem you buy is truly Hayes® and Commodore 1670® compatible therefore usable in all situations and with all services.

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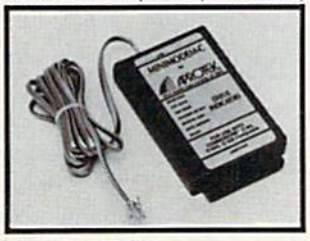

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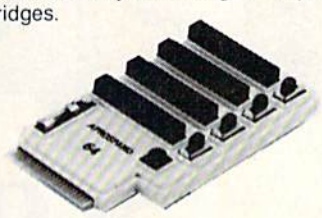

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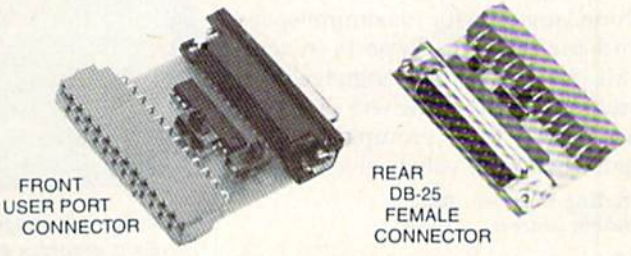

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Scorpion II

Darrell G. Rose

Sure, you've seen lots of computer solitaire games—but few, if any, can beat this one in graphics and playability. Joystick optional.

Had a hard day? Bored? Looking for a real challenge? What could be better than a quiet game of solitaire?

"Scorpion II" offers not only the challenge for which solitaire is noted, but also tricky new moves and excellent machine language animation.

Getting Started

Scorpion II is written entirely in machine language for maximum speed and playability. Type it in with "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1A40

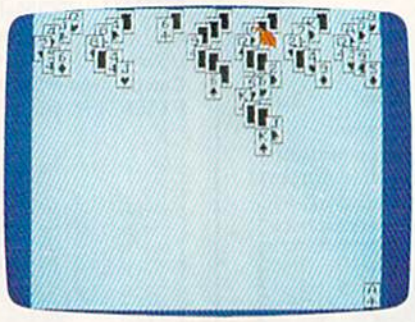
When you've finished typing in all the data, be sure to save a copy of the program to tape or disk before leaving MLX.

Although the program is written in machine language, it can be loaded and run just like a BASIC program.

The Fall of the Cards

Scorpion II deals cards into seven serpentine columns. Unlike many other forms of solitaire, all the cards are dealt—there's no deck. There are five cards face-down in the center of the top row, three in the second, one in the third, and none in the fourth. Then the pattern repeats, but there are only three cards in the bottom row.

As in most other forms of solitaire, the point of the game is to turn all cards face-up. If you accomplish this, you win the game. The odds are against you—if you play well, you'll win once every three or four games. When some cards remain face-down but no moves remain, the computer signals your loss with a chime.



Challenging strategy combined with excellent graphics and animation make "Scorpion II" one of GAZETTE*'s best card games ever.*

You can play any face-up card, including those embedded within a column. Attempt to reveal face-down cards by playing the cards that cover them. If the play exposes a face-down card, the computer turns it over.

A legal play consists of moving any card to an exposed card of the same suit. The card you place must be a single rank below the card that you place it on. When you play a card, all cards snaked below that card are moved along with it. This forms a long scorpionlike tail, which gives the game its name.

A Computer Gamekeeper

To make a play, use a joystick plugged into port 1 to move the pointer over a card; then press the fire button. The program automatically moves the selected card and its tail to the correct place. As in other versions of solitaire, aces move to a special area (the bottom right corner in this game) where you can play on them in ascending suit order, and kings can be moved to empty columns. If you're not sure whether a move is legal, try it—the program won't permit an illegal move.

If you don't have a joystick, press CTRL to move left, 2 to move right, 1 to move up, and the left arrow to move down. The space bar corresponds to the fire button.

Press Q at any time to leave the game screen. Then you can either return and attempt to finish a game—unfinished games count as losses—or proceed to the main menu. Here you can either choose to play another game with the same sequence of cards; reshuffle and play again; or end the program. The accumulated wins and losses are tallied on the main menu screen.

If a play results in the accumulation of more than 27 cards in a single column, the program automatically exchanges this column with the first column. This feature makes it easier to see the cards in the extended column.

See program listing on page 88.

illustration by Harry Blair

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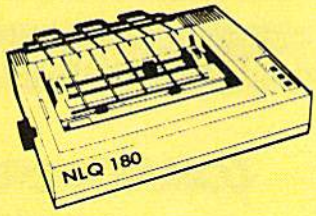

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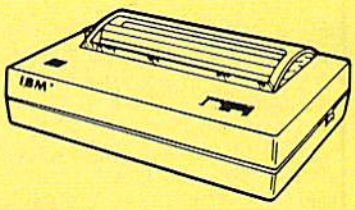

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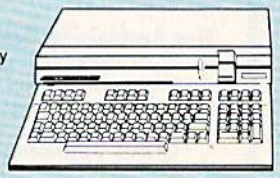

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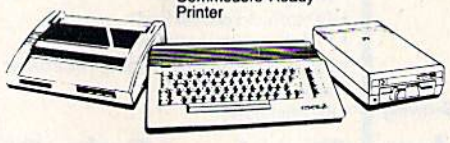

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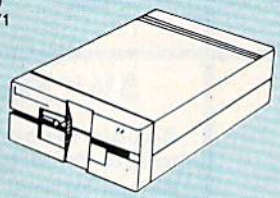

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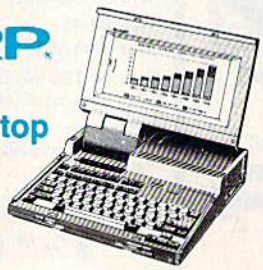

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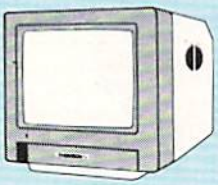

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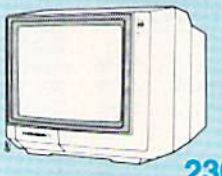

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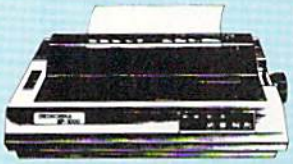

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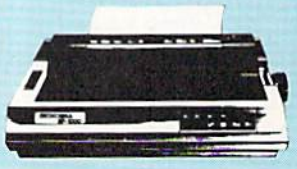

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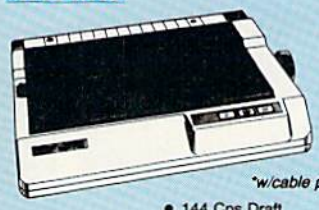

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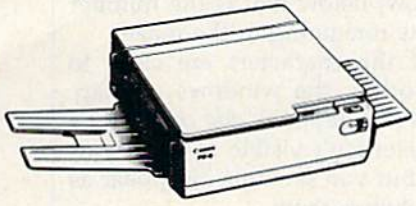

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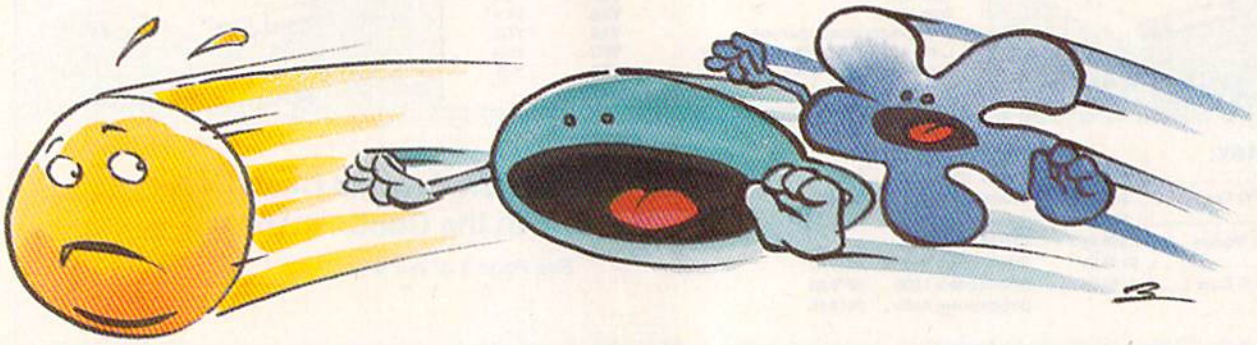


Maze Master

Bennie J. Montoya

Gobble goodies on the run in this fast-action arcade-style game for the 64. Joystick required.

Feel like racing? OK, but you'll have to do it inside a maze. Don't dawdle—your computer-controlled opponent will prove to be a tough challenger. As you dash through the mazes of "Maze Master," your competition will be hot on your heels.

Maze Master features four speeds. If you need a handicap to practice all the right moves, you can slow the 64 down a bit. Speed it up when you're feeling more fit and familiar with the territory. Only a few have vanquished the 64 at the fastest speed, but—who knows?—maybe you'll be one of them.

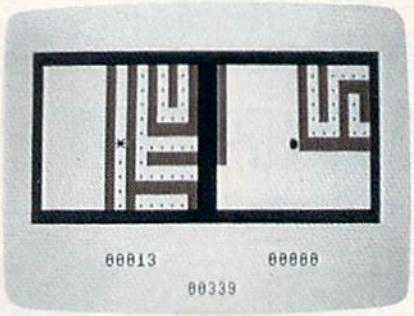
Typing It In

Maze Master is written entirely in machine language for maximum speed and playability. Type it in with "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you for the starting and ending addresses of the data, respond with the values indicated below.

Starting address: C000
Ending address: C8B7

After you've typed in all the data, be sure to save a copy to tape or disk before leaving MLX.

When you're ready to play, plug a joystick into port 2 and load the program with a statement of the form LOAD "MAZE MASTER",8,1 (tape users should type LOAD "MAZE MASTER",1,1). Substitute the name you used to save the machine language file. Now type SYS 49152 to start the game.



It's a classic battle of man versus machine when you play this double-window maze game.

Navigating the Maze

You and your computer opponent are in the same maze, starting at opposite corners. You can't see all of the maze at one time: A window on the left shows your opponent's area of the maze, and another, on the right, shows yours. Your character is a large dot, and your opponent's is an asterisk. As the characters traverse the maze, the windows follow them. Guide your character with the joystick.

The maze is stocked with dots—350 when the game starts. The object of the game is to consume more dots than the computer does by the end of the game. Below each window is the score for that window; below that is the number of dots remaining in the maze.

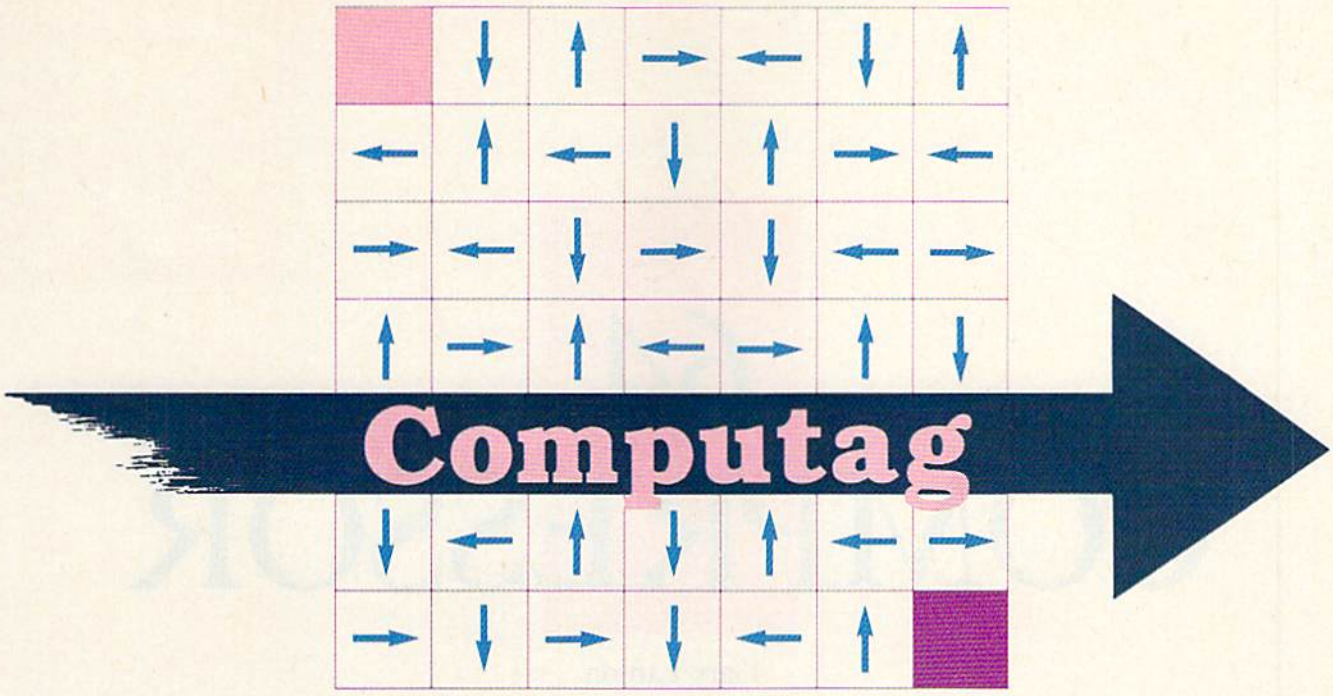
If the characters are close to each other, the windows overlap. When this happens, the computer's character isn't visible in your window, but you see dots disappear as it consumes them.

The game is over when it becomes impossible for one of the players to win. For example, the computer wins when your total plus the number of remaining dots is less than the computer's total.

You can change the speed of play by pressing one of the four function keys—f1, f3, f5, and f7. Choose f1 for the slowest speed; f7 for the fastest. The opening game begins at the slowest speed, but subsequent games begin with the ending speed of the previous game. You can change speed at any time. To end the game, press RUN/STOP–RESTORE.

See program listing on page 92.

illustration by Harry Blair



Mark Tuttle

Want to play tag in the park? This action-packed arcade-style game for two contains no limit on laughter or excitement. For the Commodore 64.

Don't let the chilly autumn days fool you. The sun's last rays of summer still warm the mellow autumn evenings enough for a rousing game of tag. Join a friend and your 64 for a romp to drive away the drearies.

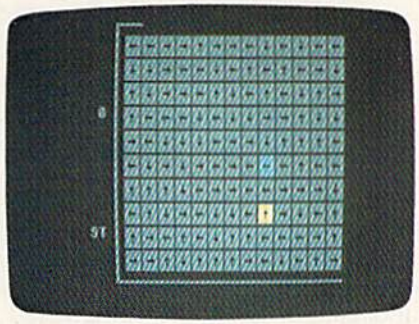
If you're not fleet of foot, don't worry. In "Computag," you and your adversary are evenly matched. You play in a grid containing arrows that limit your movement. These arrows change direction periodically. Computag keeps score, and it's even equipped with a timer so you don't stay out too long after dark.

Typing It In

First, type in the program and save a copy. Be especially careful when typing in the DATA statements. If you mistype a number, the computer may crash. To avoid typing errors, use "The Automatic Proofreader," found elsewhere in this issue.

To start the game, load it and type RUN. The game asks player 1 to select a key. Choose by pressing any key except SHIFT, which is always reserved as player 2's key.

Now select a playing speed to determine how fast the arrows in the grid will move. The slowest is 5; the fastest, 1. Once you've made the selection, you can't change it until you begin a new game.



"Computag" lets you and a friend play electronic tag—and have a lot of laughs.

Now the Chase

The grid is a 13 × 10 array of blocks. Each block contains an arrow pointing in one of the four cardinal directions. In the upper left corner is the cyan sprite belonging to player 1. Player 2's yellow sprite can be found in the lower right corner.

The arrows constantly rotate counterclockwise; the speed of rotation is determined by the playing speed entered at the start of the game. When you press your key, your sprite moves across one block in the direction indicated by the arrow in your block. To traverse the board, wait until the arrow points in the desired direction; then press your key.

As in ordinary tag, one player is "It." The player who is It must attempt to catch the other player, who in turn becomes It when caught. At the start of the game, player 2 (the yellow sprite) is It.

One player catches another by occupying the same box. When this happens, the players exchange roles and begin again at random positions on the grid.

The pursued player receives a point for every block he or she crosses to escape being caught, but the pursuer receives none. Of course, once the chaser becomes chased, he or she will win points while attempting to escape. The program keeps score on the right side of the screen.

Each game consists of two rounds. The time for each round is shown by a timer box that encloses the screen. The box disappears segment by segment, and, when it's gone, the round is over and the sprites return to their starting positions.

When the game is over, the program displays the final scores and invites you to play another game.

See program listing on page 77.

64 COMPRESSOR

Gary Lamon

As Commodore users are well aware, there is only so much space on a floppy disk. If you want to squeeze a few more programs onto a disk, try "64 Compressor." Tape users can also benefit from the program.

Compressor squeezes bytes out of BASIC programs—the bigger the program, the better the compression. Since the compressed files are shorter than their uncompressed counterparts, there's an added bonus: Compressed files load faster.

Typing It In

Compressor is written in machine language. Use "MLX," the machine language entry program found elsewhere in this issue, to enter it. When you run MLX, you are asked for the starting and ending addresses of the data you'll be entering. When MLX prompts you, respond with the values given below.

Starting address: C000
Ending address: C627

Follow the MLX instructions carefully, and be sure to save a copy of the data before exiting MLX.

To use the program, type LOAD "*filename*",8,1 (for disk) or LOAD "*filename*",1,1 (for tape); then type NEW. Use the filename with which you saved the program.

Load the program you'd like to crunch, and then start Compressor by typing SYS 49152. There's a short delay as the program is compressed. When the READY prompt reappears, save the program to disk or tape. For the sake of safety, it's wise to keep an uncompressed version of the program on a backup disk.

Turbocharge the storage capacity and speed of your tape or disk drive with this short machine language utility for the 64.

The compressed program is in a new format that the 64 doesn't understand. Load the compressed program and type LIST. You'll see this line:

```
10 SYS2070
```

The SYS command calls the machine language decompression routine that is saved along with your program. Type RUN, and your program is automatically decompressed and run. Note that Compressor does not have to be in memory when you decompress files—only when you compress them.

How It Works

Like all data in the computer, a program consists merely of a series of bytes. Each byte holds a value in the range 0–255. Normally, when a program is saved, each byte is saved to tape or disk. Compressor improves upon this scheme.

As it runs, Compressor totals and sorts occurrences of each value. Instead of storing each value with eight bits, Compressor uses fewer bits for frequently occurring values, and more bits for the less-common values. For instance, suppose a 2000-byte program consisted of 1500 spaces and 500 other characters. Compressor would store this program using one bit to represent each space, and nine bits for each of the other characters (the ninth bit signifies "not a space"). The compressed program would be 750 bytes long—a significant improvement.

If a program is short, or if each character is used about the same number of times, the compressed version may be the same length as or even longer than the original version (due to the added decompression routine). If this is the case, Compressor reports that the file can't be compressed. The program can still be saved; just use the normal Save procedure.

Although Compressor is designed for use with BASIC programs, it also works on some machine language programs that load and run like BASIC programs. For instance, *SpeedScript*, when compacted, is reduced by two disk blocks.

See program listing on page 85.

news & products

GEOS Now Bundled with 1541s

Commodore and Berkeley Softworks have announced a new bundling agreement in which all new Commodore 1541 disk drives will include *GEOS* 2.0, the latest version of Berkeley's operating system for the 64. This arrangement was effective as of July 1. Prior to this announcement, *GEOS* was bundled with 64Cs.

Circle Reader Service Number 200.

Brøderbund at the Movies and on the Slopes

Brøderbund Software recently released two new software titles: *Star Wars* and *Downhill Challenge*.

Based on the George Lucas movie and the coin-operated videogame, *Star Wars* is an arcade adventure with the player assuming the role of Luke Skywalker. Players pilot an X-Wing Fighter while attacking the Empire's Death Star. The Commodore 64 version has a suggested retail price of $29.95.

Downhill Challenge is an interactive ski-racing simulation with 3-D graphics. Players choose from downhill, slalom, giant slalom, and ski jumping. In each event, players select runs for beginner, intermediate, or advanced skiers. The Commodore 64 version has a suggested retail price of $24.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 201.

Encourage Reading Through Computers

The *Accelerated Reader* is designed to improve the reading abilities of children ages 8–18. Students select a book from the list, read it, and then take a comprehension test at the computer. The program scores the test and reports the results for each student and for the class.

The program contains 200 book titles, including such favorites as *Charlotte's Web, Pippi Longstocking, The Adventures of Huckleberry Finn, The Hobbit, Red Bad of Courage,* and *To Kill a Mockingbird*. Teachers can also enter new books and test questions.

The complete package includes the program disk, a backup disk, four testing disks, a wall chart, and an indexed manual. The entire package is priced at $300 and is available for the Commodore 64.

Readup has also released the first in a series of supplemental disks for its *Accelerated Reader* program. The new disk contains tests for 50 books, including *Big Red, The Black Stallion, Call of the Wild, The Little Prince, Lassie Come Home, Winnie-the-Pooh,* and *A Wrinkle in Time*. A supplemental disk is available separately for *Accelerated Reader* users and as an option for new purchasers of the program package. The suggested retail price is $50.

Readup, P.O. Box 95, Port Edwards, WI 54469

Circle Reader Service Number 202.

Konami for Commodore

Konami, one of the leading game producers for the Nintendo Entertainment System, has released two titles for the Commodore 64.

In *Contra*, players battle against Red Falcon in a guerrilla war fought in the Amazon jungles. Each player assumes the role of a guerrilla fighter in *Rush N' Attack*. Armed with only a knife, the fighter must rescue prisoners of war from an isolated camp.

The suggested retail price of each game is $29.95.

Konami, 815 Mittel Dr., Wood Dale, IL 60191

Circle Reader Service Number 203.

Everyday Math

Gamco Industries has released a software series entitled Math for Sucessful Living. The series includes three programs designed to help students handle math they are likely to encounter in everyday situations.

With *Timecards and Paychecks*, students choose a job and then select a lesson in Reading a Timecard, Figuring Wages, or Reading a Paycheck. *Managing a Checking Account* has lessons in Making a Deposit, Managing a Checkbook, and Balancing a Checking Account.

The third program in the series is a two-disk package called *Shopping Strategies;* it teaches students shopping skills. In At the Grocery Store, students plan a menu and buy the groceries while figuring unit prices, applying coupons, and taking advantage of specials. The second part of the program, At the Mall, requires students to prepare a shopping list, compare products, and make the best purchases.

Students can read a tutorial for each lesson and then apply their skills to specialized situations. The facts and numbers vary for each lesson. The programs provide students with a glossary, Help screens, and an onscreen calculator. Students who score a predetermined total are rewarded with a game.

Teachers have a record-keeping function that tracks students' names, scores, and lessons completed. Up to 200 names can be stored in alphabetical order.

The Commodore 64 program disks for *Timecards and Paychecks* and *Managing a Checking Account* sell for $44.95 each. A backup disk is $10 extra. A class pack or network package for each program has a suggested retail price of $164.95. The *Shopping Strategies* program disks sell for $74.95. The package with backup disks retails for $94.95, while the class pack and the network package have a suggested retail price of $329.90 each.

Gamco Industries, Box 1911, Big Spring, TX 79721

Circle Reader Service Number 204.

Human vs. Computer

Microillusions' new arcade-style adventure for the Commodore 64 pits humanity against a powerful network of computers that control every aspect of society.

In *Main Frame*, a TriComplex III master computer controls a worldwide network that tries to annihilate the human race with a supply of battle droids. The world's only hope is an uncompleted Orbiter satellite that has not been linked to the TriComplex network.

The object of the game is to save the world using Orbiter and a sophisticated assortment of assault devices. To shut down the TriComplex, players must find its four main power switches, located below the ocean. During the adventure, players fight droids, assemble power units, gather fuel, and set transport devices. Action takes place in the air, underground, and underwater.

The joystick controls all aspects of

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* Single disks for *COMPUTE!*, *Gazette*, or *Apple Applications* are $15.00. NOTE: No disks dated prior to January 1986 are available.
* Back issues of *COMPUTE!'s PC Magazine* and *Atari ST Disk & Magazine* are $16.00 each. (These publications are available only as magazine/disk combinations.) The following issues are **NOT** available: ***PC Magazine:*** 9/87, 11/87. ***Atari ST Disk & Magazine:*** 10/86, 12/86.
* Disk/magazine combinations are $16.00.

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the game, including movement, combat, and menu functions. Features include scrolling screens, graphics, and a soundtrack.

The suggested retail price for *Main Frame* is $39.95.

Microillusions, 17408 Chatsworth St., Granada Hills, CA 91344

Circle Reader Service Number 207.

Blow Hard

Accolade has released *Bubble Ghost* for the Commodore 64. Players help a ghost blow his bubble through 35 rooms of a castle without popping it.

The journey through the old mansion might seem easy, but players encounter bubble-popping spikes, knives, pins, needles, scissors, and shears. Players also run across many other gadgets and ghouls. To help them travel through each room safely, players must discover secrets hidden in the rooms.

Bubble Ghost requires the use of a joystick and has a suggested retail price of $29.95.

Accolade, 550 S. Winchester Blvd., Suite 200, San Jose, CA 95128

Circle Reader Service Number 205.

A Plus for Award Makers

Baudville has announced the release of *Award Maker Plus* for the Commodore 64. With the program, users can create professional-looking awards, certificates, and coupons. Graphics for home, education, and business are included with the package, along with borders that can be printed in color or black-and-white.

Award Maker Plus has a suggested retail price of $39.95.

Baudville, 5380 52nd St. SE, Grand Rapids, MI 49508

Circle Reader Service Number 206.

Damsel in Distress

Epyx has introduced *The Legend of Blacksilver*, the latest title in the Masters Collection of software for the advanced player.

The Princess of Bantross seeks a hero to rescue her father, the King, from the evil Baron Taragas. The Baron is possessed by Blacksilver, a mystical mineral that brings out his corrupt side. His plan is to submerge the existing continent, raise another from the ocean, and create his own creatures to inhabit the land.

Players travel through a world of medieval richness, politics, natural disturbances, dragons, and sorcerers. They endure tests of skill, battle monsters, and search for clues and objects to aid their quest. Ultimately, they must make a sword of Blacksilver to capture Taragas and save the planet.

The Legend of Blacksilver is available for the Commodore 64 and has a suggested retail price of $39.95.

Epyx, P.O. Box 8020, Redwood City, CA 94063

Circle Reader Service Number 208.

Huddle Up!

The Melbourne House has recently released *John Elway's Quarterback* for the Commodore 64. Translated from the arcade game of the same name, *Quarterback* allows the player to play the game instead of standing on the sidelines coaching.

The game features all 28 National Football League teams, with all players displayed in arcade-quality graphics and animation. Players rely on both strategy and skill, calling their own plays and then executing them.

John Elway's Quarterback has a suggested retail price of $29.99.

Melbourne House is a member of Mastertronic Group.

Mastertronic Int., Unit 9G, Mesa Business Center, 711 W. 17th St., Costa Mesa, CA 92627

Circle Reader Service Number 209.

They're Off!

The Software Exchange has introduced a series of advanced racing handicapping programs for the Commodore 64. Racing enthusiasts can use their 64 to handicap thoroughbred, harness, greyhound, and quarter-horse races. Users can handicap the races by using information found in the racing form, the harness program, the greyhound program, and the quarter-horse program.

The handicapping system uses past-performance data, including race length; post position; speed ratings and variants; times; odds; class; positions at the ⅛-, ½-, and ¾-stretch positions; and finish positions.

The program requires a maximum of 17 data entries per horse or dog to perform the analysis to predict the outcome of the race. The data entry takes about ten minutes of typing per race. A time adjustment factor has been added to correct for different race lengths.

To aid in the selection, ratings are sorted from best to worst and can be printed on a line printer. Each package contains a bet-return analysis program to track daily winnings.

The *Advanced Thoroughbred Racing System*, the *Advanced Harness Racing System*, and the *Enhanced Quarter Horse System* have a suggested retail price of $64.95 each. The *Advanced Greyhound Racing System* sells for $74.95. The programs are available on cassette or disk.

Software Exchange, P.O. Box 5382, W. Bloomfield, MI 48033

Circle Reader Service Number 210.

the geos column

A Close Look at *geoProgrammer*

Dale McBane
Assistant Technical Editor

Since its introduction, *GEOS* has been one of the best-selling software packages for the 64, but applications for *GEOS*, other than those released by Berkeley Softworks, have been slow in coming. A major reason for this lack of outside development is that it's very difficult to write *GEOS* applications using a standard 64 assembler. Berkeley has come to the rescue with *geoProgrammer*.

According to its manual, *geoProgrammer* is a "sophisticated set of assembly language development tools, designed specifically for building *GEOS* applications." The package includes an extensive 438-page manual, an assembler, a linker, a debugger, symbol files, macro files, and example source files.

In the Package

The *geoProgrammer* manual is very thorough, but it doesn't try to teach 6502 assembly language. The body of the manual contains an introductory tutorial followed by a detailed reference section for each of the major programs included in the package. The tutorials demonstrate how to get the programs up and running and explain how to use some of the basic commands. The reference sections provide the detailed information. The appendices contain descriptions of the macros in the geosMac file, along with printouts of the symbol, macro, and source files.

Three programs make up the heart of the *geoProgrammer* environment: geoAssembler, geoLinker, and geoDebugger. Together with *GEOS* and geoWrite, these three create an excellent working environment.

geoAssembler is a moderately fast, extremely powerful macro assembler. It has features that you'd normally expect to find in much more expensive development systems. (*geoProgrammer* is patterned after the UNIX-based development system used at Berkeley Softworks.) Whereas most 6502 assemblers assemble source code directly into executable machine language, geoAssembler generates relocatable object files which are converted into executable files by geoLinker. This intermediate step allows you to reuse code without rewriting or even reassembling it. You can build a library of often-used subroutines and link the ones you need into your main program.

The Big Picture

Another unique feature of geoAssembler is its ability to translate bitmapped-graphics data directly into binary. With this feature, you can paste graphics directly into your source code. geoWrite's Paste Picture command makes it easy to add graphics to your program.

Many of geoAssembler's other features are not as unique. It sports a powerful macro language, it allows you to include other files in the assembly, and it supports local labels.

geoLinker takes the relocatable object files generated by geoAssembler and creates the executable code. It uses a command file to decide where the program code and variable data will be located in memory. The command file also tells it which object files and which header file to include in the program.

The geoLinker program is responsible for cross-referencing unresolved labels from source files with the global labels of other files. This capability is what actually allows you to write your code in separate sections. geoLinker can generate *GEOS*-compatible application files in either sequential or variable-length indexed record (VLIR) formats. It can also generate standard CBM files or VLIR overlays.

In geoDebugger, you'll find nearly every option you could need while debugging your program. It features symbolic assembly and disassembly; conditional breakpoints; memory examination, comparison, and modification; execution commands such as single step, subroutine step, finish loop, and finish subroutine; a hot key to return you to the debugger at any time; and a complete macro language.

Unlike some debuggers, geoDebugger doesn't make you wait for your program to crash before you can use it. It remains coresident with your application and maintains the *GEOS* screen and its own debugging screen. It automatically uses the RAM-expansion unit (REU) if it's available. This allows you to debug large applications.

Pros and Cons

The only flaw in the *geoProgrammer* package is the editor. None is provided by *geoProgrammer* itself—you must use geoWrite. Although geoWrite is a terrific word processor, it's too slow and cumbersome to be a good text editor. If you don't have geoWrite version 2.0 or higher, the speed problem becomes even more obvious. At least geoWrite 2.0 has a search-and-replace function that proves invaluable when you're editing your code.

geoProgrammer is a *GEOS* programmer's dream. With an REU, assembling and linking are not blazingly fast, but they don't take all day, either. You can use the example source code provided as a basis for your own programs. All you do is flesh out what's there, assemble, and link. It's so easy to make changes, assemble, and test that you'll find yourself testing even minor changes. You'll no longer forget what you were testing while you wait for *GEOS* to reboot.

See sample geoProgrammer *listing on page 76.*

SpeedPrint

Stephen Weatherford

Do you use* SpeedScript *with a 1525, MPS-801, MPS-803, or MPS-1200 printer? Here's how you can give your documents some exciting new features: italics, superscripting, subscripting, and underlining. And you can use any of the three custom fonts included, or design your own.

Many Commodore 64 owners use one of the popular Commodore printers: 1525, MPS-801, MPS-803, or MPS-1200. Although they're affordable and sturdy, they lack many features found on other printers—for example, italics, super- and subscripting, foreign character sets, and even underlining. Also, there are no descenders on any of the letters—the letter *p*, for example, doesn't descend below the baseline. This makes it look like a capital letter. The lack of descenders makes the print unacceptable for most formal writing, term papers, and even letters. Fortunately, it's possible to correct this and some other shortcomings.

"SpeedPrint" is a program that adds features like italics, super- and subscripting, and underlining to your Commodore odd-series printer. You can even create and use your own fonts. In addition, SpeedPrint's characters can have true descenders and ascenders. (Each character may have a total of 18 pixels vertically and 6 horizontally.) So, the letters *g*, *j*, *p*, *q*, *y*, and the comma and semicolon can have a much more natural appearance. Special superscript or subscript characters which make use of this extra space (for example, numerals) can be defined in any font. Figure 1 shows some examples of what can be done.

For *SpeedScript* Only

SpeedPrint works in conjunction with COMPUTE!'s popular *SpeedScript* word processor. With SpeedPrint installed with *SpeedScript*, you won't even know it's there until you print your file. It's transparent, but your printer has acquired much more capability.

To use SpeedPrint, you must have a copy of *SpeedScript* version 3.0, 3.1, or 3.2. Version 3.2 is preferable, since it corrects some minor bugs found in the earlier versions. (If you already have a copy of version 3.0 or 3.1, you can easily update to version 3.2 by following the directions given in the May 1987 issue. This issue also includes the complete listing of version 3.2, as well as full instructions for using the program.)

Starting Off

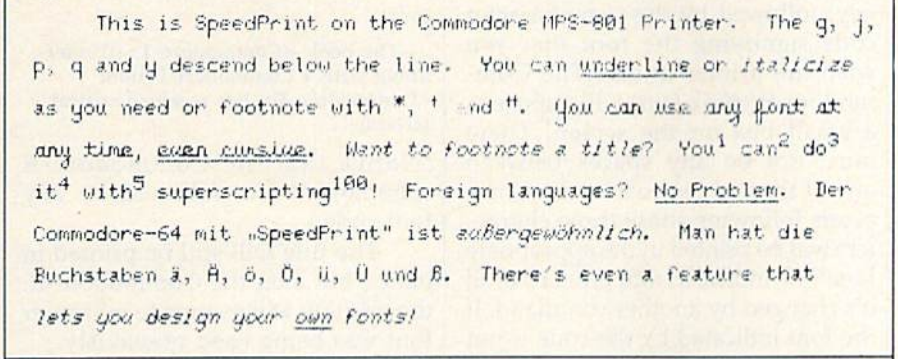
Once you have a version of *SpeedScript* on disk, use "The Automatic Proofreader," found elsewhere in this issue, to type in Program 1. This BASIC program is designed to load both *SpeedScript* and SpeedPrint. Before saving it, check line 50 to be sure that the string assigned to the variable SS$ is the name of your *SpeedScript* file. If it isn't, change the string to match it. Save the program with the filename SPEEDPRINT.

Program 2, the main SpeedPrint program, controls the printing. Since it's written in machine language, it must be entered using "MLX," the machine language entry program found elsewhere in this issue. When you run MLX, you'll be asked for the starting and ending addresses of the data you'll be entering. For SpeedPrint, use the following values:

Starting address: C000
Ending address: C48F

Follow the MLX instructions carefully. After you've entered the data, use MLX to save a copy as

Figure 1


This is SpeedPrint on the Commodore MPS-801 Printer. The g, j, p, q and y descend below the line. You can underline or italicize as you need or footnote with *, † and ††. You can use any font at any time, even cursive. Want to footnote a title? You[1] can[2] do[3] it[4] with[5] superscripting[100]! Foreign languages? No Problem. Der Commodore-64 mit „SpeedPrint" ist außergewöhnlich. Man hat die Buchstaben ä, Ä, ö, Ö, ü, Ü und ß. There's even a feature that lets you design your own fonts!

SPEEDPRINT.ML (Program 1 looks for a file of this name).

In addition to Programs 1 and 2, SpeedPrint includes a font editor (Program 3) and three sample fonts (Programs 4, 5, and 6). To use SpeedPrint, you'll need at least one font. Program 3, the font editor, can be used to modify existing fonts (such as Programs 4, 5, and 6—see below) or to create your own. Program 3 is written in BASIC, so if you plan to enter this program, you should again use the Automatic Proofreader to ensure accurate entry. When you've finished typing, save the program with the filename SP FONT EDITOR.

The fonts in Programs 4–6 serve as examples if you decide to create your own fonts with the font editor. Program 4, called the Standard font, is a normal font that contains the standard printer characters but corrects the lowercase letters that use descenders. Program 5 is a useful italic font; Program 6 is a fancy cursive one.

Each of the fonts includes some special characters not found in the printer's normal mode; these will be explained later. To enter any of these fonts, use MLX, responding with the following addresses and filenames (the filenames must be exact):

Filename: FONTST/STANDARD
Starting address: C000
Ending address: C19F

Filename: FONTIT/ITALIC
Starting address: C000
Ending address: C40F

Filename: FONTCU/CURSIVE
Starting address: C000
Ending address: C347

Program 1 will automatically relocate these fonts when you wish to use them with SpeedPrint.

After being entered and saved, any of these three fonts can be loaded by Program 1 for use as a font in printing, or they may be loaded, edited, and saved by the font editor (Program 3).

Running SpeedPrint

To use *SpeedScript* with SpeedPrint's powerful printing capabilities, load and run Program 1. Program 1 loads the machine language routine, prints a list of the fonts which are loaded in memory, and prompts you for the names of any additional fonts to be loaded. The list contains two simple fonts which are included in the program and do not have to be loaded.

The first font on the list is called BASIC and has the two-letter code BA (this is shown in the list). It's the font the Commodore odd-series printer normally uses at power-up. Although this font doesn't include the special characters found in some of the other fonts, it does allow underlining.

The second font is called DEFAULT (its code is DF) because it's the default font used by SpeedPrint if no other font is requested. It's similiar to the standard font (Program 4), differing in that it doesn't include some of the extra characters contained in that font. If these two fonts suffice for a particular session of using SpeedPrint, simply press the RETURN key at the first prompt. *SpeedScript* will automatically be loaded along with these two fonts.

If you'd like one or more fonts besides these two, you can enter their names at the prompt. There are two ways to do this. One way is to first enter the name of the font (not the filename). The program will then ask for the two-character code associated with the font. For instance, to use the italic font, enter its name, ITALIC, at the first prompt. Then, at the second prompt, enter its code, IT.

The other method is to enter the font's filename. A valid font filename is in the format: "FONT*cc*/*name*", where *cc* is the two-character code and *name* is the name of the font. Thus, you can enter FONTIT/ITALIC at the first prompt. In either case, the program will display the corresponding filename and ask for a verification to load and install this font. Press Y to load the font. The font is loaded, installed, and added to the list. You'll then be prompted for any other fonts to load—SpeedPrint can handle up to 10 different ones.

Figure 2 shows the fonts included in this article.

Using SpeedPrint

Next, SpeedPrint loads and runs *SpeedScript*. *SpeedScript* works exactly as before, with all its features intact. However, you can now control the appearance of the output.

When you first use SpeedPrint, you must create a header file. To do

Figure 2

this, type in the short file shown in Figure 3. Remember that wherever a character appears in reverse video, you must first type CONTROL-3 or CONTROL-£. *SpeedScript* will then ask for a format character. Type the desired character and it will appear in reverse video. When you have finished, save this file by pressing the f8 key and entering the filename HEADER.

Figure 3

```
0=1281=1292=1303=1314=132←
5=1336=1347=1358=1369=137←
"=142t2b29p33s1←
```

Whenever you type in a new file using *SpeedScript* and SpeedPrint, you must first load this header at the top of the file. This step is crucial: Because SpeedPrint characters descend and ascend more naturally, the printer must be in double-spaced mode. *SpeedScript*, however, is not aware of this change and will try to print 66 double-spaced lines on a page. The header adjusts this problem by redefining the paging parameters of *SpeedScript*. Remember that when *SpeedScript* is using SpeedPrint, it can print only in double-spaced mode (or any multiple of it, but not, for instance, in triple-spaced mode). The header also defines several second-stage *SpeedScript* commands to let you access some of the newly defined characters in the fonts.

The first new feature is that the underline option included in *SpeedScript*, which normally does not work on Commodore printers, now works perfectly with SpeedPrint. To use this option, type CONTROL-3 or CONTROL-£ and a lowercase *u* where you wish to begin the underlining. Use the same procedure where you want underlining to end.

Although the characters on the screen look normal, all characters will be printed using the current font.

The Commodore Commands

The current font can be changed at any point in a *SpeedScript* file with three character-code commands: Commodore-F, Commodore-T, and Commodore-R.

To change the font in use at any point in the file, type a Commodore-F (that is, hold the Commodore key down and press the F key) followed by the two-character code signifying the font that you wish the printer to use. The Commodore-F (think *font*) will appear as a small box on the screen. There must not be any spaces between any of these three characters. Characters following these three characters will be printed in the appropriate font. The indicated font remains until it's changed by another command. If the font indicated by the code is not installed in memory, the command will be ignored.

Commodore-T is a special temporary–font change command. Typing Commodore-T followed immediately by the code of an installed font will change the printing to the new font, just as with Commodore-F. However, the font in use when the Commodore-T command is executed will be remembered until a Commodore-R command is reached (think *restore*). When the computer reaches a Commodore-R command, the font that was in use before the last Commodore-T command was executed is reinstated. That is, Commodore-T causes a font to be used temporarily until a Commodore-R command is reached. Commodore-T and Commodore-R pairs may be nested up to eight levels deep.

There are two main uses for the Commodore-T/Commodore-R pair. First, it can be used to print a few words in italics (or some other font). Suppose, for instance, you are using the font DEFAULT and you wish to italicize a book title. Part of the text can be typed as

. . . The book <Commodore-F>itUnderlining with a Commodore Printer <Commodore-F>df has received critical acclaim. . . .

Assuming SpeedPrint has already been using the DEFAULT font, the text up to the book title will be in DEFAULT. Then the font is changed with a Commodore-F command to the ITALIC font, and it's changed back to DEFAULT with another Commodore-F. This is fine. However, if you decide at some time to change the whole text to the CURSIVE font, you'll have to place a Commodore-F command at the beginning of the file and replace every <Commodore-F>df sequence with <Commodore-F>cu. To avoid this inconvenience, you can use a Commodore-T/Commodore-R pair:

. . . The book <Commodore-T>itUnderlining with a Commodore Printer <Commodore-R> has received critical acclaim. . . .

(Notice that the Commodore-R command is not followed by any font code.)

The title will still be printed in italics, but after the Commodore-R, the printing will resume to whatever font was being used previously.

Foolproof Headers

The other use for the Commodore-T/Commodore-R pair is even more important. If you're changing fonts in a *SpeedScript* file and you wish to use *SpeedScript*'s header or footer capabilities, you should use a Commodore-T/Commodore-R pair within the header or footer to let the printer know which font to use there.

Here's why. Suppose you're using the DEFAULT font throughout most of the text, but you have a four-word italicized title embedded somewhere in the text. In addition, you're using headers on each page. You type in the file and tell *SpeedScript* to print it. On the first page, *SpeedScript* manages to print much of the text and two words of the title before running out of space. Because at the beginning of the title you changed to the ITALIC font, the printer is still printing in italics. *SpeedScript* goes to the next page and prints the header in the current font, ITALIC.

To keep this from happening inadvertently, use Commodore-T to change the font to DEFAULT (or whatever font you wish) at the beginning of the header and use Commodore-R at the end of the header. Then no matter what font the computer is using when the header or footer is printed, the correct font will be used and the old font will be restored afterward.

Special Characters

You may have noticed that in Figure 2 all fonts except DEFAULT and BASIC have several characters which cannot be found in the user manuals for the Commodore odd-series printers. That's because these have been created using the font editor and are included in these fonts to be used by SpeedPrint.

Figure 4

Character	What to Type
Superscripted Numeral	CONTROL-3 followed by the Numeral
Single Cross (†)	SHIFT-PLUS
Double Cross (‡)	COMMODORE-PLUS
Triple Cross (‴)	COMMODORE--PLUS then SHIFT-PLUS
(etc.)	
Raised Asterisk (⁎)	SHIFT-ASTERISK
ä	COMMODORE-A
Ä	COMMODORE-B
ö	COMMODORE-O
Ö	COMMODORE-P
ü	COMMODORE-U
Ü	COMMODORE-V
ß	British Pound Key (£)
„ (Special German Quote)	CONTROL-3 followed by SHIFT-2

The new characters are the superscripted numerals, three footnoting symbols, and eight characters from the German alphanumeric system. The superscripts and the footnoting symbols can be very useful in, for instance, a term paper or a formal published article. The German characters were included to illustrate the possibilities of using SpeedPrint to work with non-English alphabets. With these eight added characters, anything in German can be written using *SpeedScript* and SpeedPrint. Of course, if you have no need for any of these characters, you can remove them with the font editor (Program 3) or replace them with other symbols.

To access the superscripted numerals, press CONTROL-3 or CONTROL-£ followed by the numeral you wish to superscript. (Remember that these characters are not in the DEFAULT or BASIC fonts.) The intended numeral will appear in reverse video on the screen. The HEADER file defines these extensions, so make sure you have included it at the beginning of your *SpeedScript* file.

The first footnoting character, a single raised cross, is obtained by holding down SHIFT and pressing the plus key (think *a cross*). To obtain the double cross, hold the Commodore key down and press +. Finally, the raised asterisk is obtained by pressing SHIFT-*. These characters appear as assorted graphics symbols onscreen, but they print as intended.

Figure 4 shows how to obtain the German characters as well as the special symbols that have already been discussed. The keys were made as easy to remember as possible. Another possibility would have been to use second-stage commands defined with *SpeedScript*—for instance, a reverse video capital *A* for an umlauted *A* (an *A* with two dots above it: ä). Unfortunately, *SpeedScript* doesn't consider these reverse video commands to be characters, and it won't allow them to be underlined. Therefore, the superscripted numerals and the special German quotation, as defined in the header, cannot be underlined.

Create Your Own Fonts

Using Program 3, you can modify the STANDARD, ITALIC, and CURSIVE fonts as well as create your own entirely from scratch. These fonts can then be loaded by SpeedPrint to be used in your *SpeedScript* files.

To SpeedPrint, a *font* is the normal set of characters with any or all characters redefined. A font may be standard except for, say, the question mark, which has been redefined to appear upside down. Or perhaps the letters and numerals and several punctuation symbols have been redefined to look slanted, as in the ITALIC font. The point is, not all of the characters have to be redefined. In fact, the Commodore odd-series printers are much faster when fewer characters have been redefined.

The font editor keeps a list of those characters which have and have not been redefined. Any or all may be declared as redefined. When a character is redefined, a 6 × 18 pixel grid is shown on the screen, separated into three vertical sections. This partitioning is a guide to show you where the characters are placed. In normal print, only the middle section is used. Check your printer manual to see how the characters are defined. (Unfortunately, these are not offered in the MPS-1200 manual.) Notice that the rightmost column of pixels is normally left blank to create a separation of letters in printing. However, the CURSIVE font disregards this rule to connect the letters.

The current character being defined and its ASCII code are shown in the upper right corner. (Be careful—sometimes there are multiple representations of characters, as with the uppercase letters. Use the A command, below, to find out which ASCII code to use with a given key.) A list of commands is in the lower right corner. A letter *U* with an arrow indicates where underlining takes place. If the current character has been declared as redefined, the grid will show its redefined shape. Otherwise, a message will appear, indicating that the character has not been redefined. To change a characters status, use the E and I commands (below).

Editor Commands

All of the font editor's commands are single-key or shifted single-key commands. They operate as follows:

Cursor Keys. The up-, down-, right-, and left-cursor keys all move the cursor inside the grid. The cursor wraps around to the next line when it reaches the edge of the grid.

RETURN moves the cursor to the beginning of the next row of pixels.

HOME brings the cursor to the upper left corner of the grid.

CLR brings the prompt "Clear Character (y/n)?". If you answer *y*, the grid is cleared to all blanks.

SPACE. The space bar toggles the pixel under the cursor from on to off or from off to on.

PLUS. By tapping the plus key (+), you move to the next higher ASCII character. By holding this key down, you can quickly choose the next character you wish to redefine. ASCII codes 32–255 can be redefined.

MINUS. The minus key (−) chooses the next lower character as the current character.

SHIFT-PLUS causes the computer to search through the characters to the next character in the list of redefined characters. The search is forward (increasing ASCII values).

SHIFT-MINUS searches backward for the next character declared as redefined.

I (for *include*) includes the current character code in the list of redefined characters—in other words, declares it as redefined.

E (for *exclude*) excludes the current character code from the list of redefined characters.

G (for *go to*) takes you to a given ASCII code. The computer allows you to enter the ASCII code of the character to go to.

C (for *copy*) copies the current character to another character. Enter the ASCII code of the character to overwrite. The computer will show you the target character and ask if you are certain you want it to be overwritten. Answer with *y* to execute the copy.

A (for *ASCII*) displays the ASCII code of the next key pressed. Use this command to find the ASCII code of a character you wish to redefine.

P (for *print*) sends the current character to the printer to see how it looks (redefined characters only). Make sure your printer is on, or you'll get a ?DEVICE NOT PRESENT error. The character is printed twice—the second time with underlining.

SHIFT-P (*print string*) sends a string of characters to the printer. This allows you to see how the characters appear together. Enter a string of characters, redefined or not, to be printed. The characters are printed once normal and once underlined. Because the font editor is written in BASIC, the printing is much slower than it will be when you're using SpeedPrint.

L (*LOAD*) loads a font. As with the SpeedPrint loader program, you can enter either the full filename (as in FONTIT/ITALIC) or the font name (ITALIC) and the code (IT) at the next prompt. The font will be loaded and the redefined character list will be updated.

S (*SAVE*) saves a font. Again, you can enter the full filename or the font name and code separately. If you are creating a new font, make sure your two-character code is different from all codes used with any of your other fonts. The program will not load two fonts with the same code.

Q (*quit*) quits the program. You'll be asked for confirmation before the program exits.

See program listings on page 79.

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RAM Save

Kevin Picott

The Commodore 64 has more memory available than you may realize. This powerful utility shows you how to tap that RAM for use as a spare storage area or a substitute for the 64's built-in ROMs. In effect, you can change the complexion of your computer. A disk drive is required.

The Commodore 64 has two 8K banks of RAM that share the same addresses as the BASIC and Kernal ROMs (locations $A000–$BFFF and $E000–$FFFF, respectively). Although rarely exploited, this RAM can come in handy. First, it can be used to store data or machine language programs. Second, it can fill in for the BASIC and Kernal ROMs. Since RAM can be modified, you can customize your computer. For instance, you can make it say *HI AL* instead of *READY.*

"RAM Save" is a utility that allows you to save this hidden RAM to disk. Included in this article are examples that show you how to save machine language programs that reside in this area of memory, and how to create and save customized versions of BASIC and the Kernal. Experienced machine language programmers can even add their own commands to BASIC.

Getting Started

RAM Save is a machine language program written in the form of a BASIC loader. Type in the program. To ensure accurate entry, you should use "The Automatic Proofreader," found elsewhere in this issue. Be sure to save a copy to disk when you've finished typing.

To use RAM Save, load the program and type RUN. The program POKEs the machine language program into memory while checking for typing errors in the DATA statements. If no errors are detected, the program executes a SYS to the beginning address of the machine language program, activating RAM Save. A message then appears on the screen. Besides letting you know that RAM Save is active, the message gives you information on the format of the save command.

Once RAM Save is active, you can save to disk any section of memory in the hidden RAM. All RAM Save needs is the starting and ending addresses of the memory section and a filename. Here is the format of the command:

```
SYS49152,S-65536,E-65535,N$
```

where *S* is the starting address, *E* is the ending address, and *N$* is the filename, with *,P,W* appended to it. For instance, to save the memory area 40960–49151 with the name NEWBASIC, use the following command:

```
N$="NEWBASIC,P,W":
  SYS49152,40960-65536,49151-65535,N$
```

To load the file back into memory, just append a *,1* to the normal load command. For instance, to load the file saved from the previous example, use the command:

```
LOAD"NEWBASIC",8,1
```

A Custom BASIC

Making changes to BASIC or the Kernal is not a trivial matter; it requires detailed knowledge of the workings of the 64. However, there are a few simple changes that you can make. To get started, BASIC must be copied from ROM to RAM. Use this line:

```
FORI=40960TO49151:POKEI,PEEK(I):
  NEXT
```

Next, switch in the BASIC in RAM. Bit 0 of memory location 1 controls whether the ROM or RAM at 40960 is active (1 = ROM, 0 = RAM). To switch in the RAM, type

```
POKE1,PEEK(1)AND254
```

Although no change is apparent, the BASIC in RAM has been switched in. Verify this by typing

```
POKE41853,ASC("!")
```

Memory locations 41848–41853 contain the text for BASIC's *READY.* prompt. Location 41853 is the period, so POKEing the ASCII value of an exclamation point there changes BASIC's *READY.* prompt to *READY!*. This and other examples of customizing BASIC can be found in *COMPUTE!'s First Book of Commodore 64 Sound and Graphics* and *Mapping the Commodore 64* by Sheldon Leemon, both published by COMPUTE! Books.

A Custom Kernal

Would you like to make SAVE and LOAD default to the disk drive? RAM Save makes it easy. Simply copy the Kernal to RAM, switch in the RAM, and then modify the new RAM-based Kernal. BASIC is automatically switched out along with the Kernal, so both BASIC and the Kernal must be copied to RAM. Type this line to copy BASIC and the Kernal to RAM:

```
FORI=40960TO49151:POKEI,PEEK(I):
  NEXT:FORI=57344TO65535:POKEI,
  PEEK(I):NEXT
```

Now you can switch in the RAM. Bit 1 of memory location 1 controls whether the ROM or RAM at 57344 is active (1 = ROM, 0 = RAM). Switching in the RAM should be as easy as ANDing memory location 1 with 253 and storing the result back at memory location 1, but it's not. One peculiarity of the 64 is that either bit 0 or bit 1 of memory location 1 can be set to 0, but not both of them. If you switch out the Kernal while BASIC is switched out, the 64 locks up. As a precaution against this, first switch in BASIC and then switch out the Kernal. Type

```
POKE1,(PEEK(1)OR1)AND253
```

This switches out both the Kernal and BASIC. To make SAVE and LOAD default to the disk drive, POKE an 8 to memory location 57818. (This location contains the default device number. The disk drive is device 8.) Now type LOAD"$" (without the *,8*) and press RETURN. Instead of the usual *PRESS PLAY ON TAPE* message, the disk directory is loaded. This change affects both SAVE and LOAD; you no longer have to add *,8* to either. (Note that this is for BASIC programs only. When loading a machine language program or a file containing graphics data, you still need to append *,8,1* to the end of the filename. This is to ensure that it loads at the correct location in memory.)

How It Works

Saving the RAM underneath ROM is a tricky matter. One way of doing this would be to switch in the RAM, copy the entire section to a safe area elsewhere in memory, switch the ROM back in, and then call the Kernal SAVE routine. This works, but it requires a safe section of memory as large as the section you're saving. If you wanted to save an 8K block of memory, you'd need another 8K block somewhere else in memory. In a computer with only 64K, this could be a problem. Clearly, there must be a better way.

RAM Save solves the problem by breaking a large memory section into smaller blocks. The small block is copied to a safe place in RAM and saved, the next block is copied and saved, and so on until the entire section has been saved.

See program listing on page 92.

bug-swatter

Modifications and Corrections

• "Investor" (August 1988) contains three lines that were listed incorrectly. Lines 690 and 1250 have question marks that were added by the lister program. Line 40 was improperly tokenized before it was listed. Here are the correct lines:

```
RB 40 IFPEEK(65530)=5THENBANK1
     5:H=241
GA 690 IFB(X)>=-99 THEN PRINT"
     {SPACE}";:GOTO730
QR 1250 PRINT:PRINT"{UP}
     {2 RIGHT}{30 SPACES}"
```

• "Scrambler" (July 1988) also fell victim to the lister program. In this case, the lister interpreted some of the character codes in line 120 and lines 140–160 incorrectly. Below are the correctly listed lines.

```
KJ 120 PRINT"C{R}K{5 SPACES}
     {PUR}BJKB{5 SPACES}{3}B
     {7 SPACES}";
KR 140 PRINT" J {GRN}{A}CCI{3}
     {Z}CCI{CYN}UCCK {6}K JK
     {4 SPACES}{RED}B";
SE 150 PRINT"{8 SPACES}{BLU}
     {Q}CC{W}{6 SPACES}{GRN}
     {Q}CC{W}{3 SPACES}";
HS 160 PRINT" {CYN}{Q}C
     {11 SPACES}{RED}JCCK
     {5 SPACES}{BLU}K ";
```

• "Cribbage 128" (August 1988) contains two lines that, again, were victims of our lister program, and two lines that are simply difficult to read for type-in purposes. All four lines have been relisted below.

```
JK 980 CHAR1,21,18:PRINT"{Q}***
     *******{W}"
FR 3460 DFF=ABS(CN(A)-NP(I-1)):
     AVR=(CN(A)+NP(I-1))/2:N
     X=INT(AVR+1.5*DFF-3)
PD 4350 DATA"£{SPACE}{*}","
     {SPACE}{RIGHT}{SPACE}",
     "{SPACE}{2 RIGHT}","
     {SPACE}{RIGHT}{SPACE}",
     "{OFF}{*}{RVS}{SPACE}
     {OFF}£","{2 SPACES}{*}
     ","{SPACE}{RIGHT}{OFF}£
     ","{2 SPACES}{*}","
     {SPACE}{RIGHT}{SPACE}",
     "{SPACE}{RIGHT}{SPACE}"
     ,"{3 SPACES}","{RIGHT}
     {SPACE}{RIGHT}","
     {RIGHT}{SPACE}{RIGHT}",
     "{RIGHT}{SPACE}{RIGHT}"
     ,"{3 SPACES}","
     {2 SPACES}{*}","{SPACE}
     {RIGHT}{OFF}£","
     {2 SPACES}{*}","{SPACE}
     {RIGHT}{SPACE}","
     {2 SPACES}{OFF}£"
ME 4360 DATA"{2 SPACES}{*}","
     {SPACE}{RIGHT}{OFF}£",
     "{2 SPACES}{*}","
     {SPACE}{RIGHT}{SPACE}"
     ,"{2 SPACES}{OFF}£","£
     {SPACE}{*}","{SPACE}
     {RIGHT}{SPACE}","
     {3 SPACES}","{SPACE}
     {RIGHT}{SPACE}","
     {SPACE}{RIGHT}{SPACE}"
     ,"£{SPACE}{*}","
     {SPACE}{2 RIGHT}","
     {SPACE}£{SPACE}","
     {SPACE}{RIGHT}{SPACE}"
     ,"{OFF}{*}{RVS}{SPACE}
     {OFF}£","{3 SPACES}","
     {SPACE}{2 RIGHT}","
     {2 SPACES}{RIGHT}","
     {SPACE}{2 RIGHT}","
     {3 SPACES}"
```

SPEED COLUMNS

Add a professional look to your printed SpeedScript documents with this versatile utility. For the 64 with a disk drive.

Robert Bixby

If you use *SpeedScript*, COMPUTE!'s popular word processor, "Speed Columns" adds an excellent new feature: multiple-column printing.

Speed Columns is a print formatter for use with *SpeedScript* files. (Speed Columns is not an editor in itself.) You use *SpeedScript* to create the file you wish to print and then run Speed Columns to format the file into a specified number of columns. Speed Columns also takes care of such formatting commands as page numbering, headers, and justification. It even allows you to add a title and name to the beginning of the first page.

Getting Started

Speed Columns is written in machine language, so you'll have to use "MLX," the machine language entry program, to enter it. When you run MLX, you'll be prompted for the beginning and ending addresses of the machine language. When MLX prompts you, respond with the values given below.

```
Starting address:  0801
Ending address:    1720
```

After you've finished entering Speed Columns, be sure to save a copy to disk before leaving MLX. Speed Columns is written in machine language, but you can load and run it as if it were a BASIC program.

To get started, simply load and run Speed Columns. When you first run it, Speed Columns prints the following menu:

```
Press L to load
      P to print    Q to quit
```

To print a document, you must first load it into Speed Columns. (Speed Columns ignores the keypress if you press P before successfully loading a document.) Press L and type the name of the document you want to print. When you press RETURN, Speed Columns loads the file, displays the disk status, and prompts you to press any key. Speed Columns then returns to the first menu. From there, you can press P to print the file you just loaded, L to load another file, or Q to quit Speed Columns and return to BASIC.

If you press P, you'll see a list of print parameters and their default values. To change a parameter, press the key corresponding to the first letter of the parameter you wish to change. Pressing the first letter corresponding to a parameter increases the parameter. Pressing the SHIFT key and the first letter of a parameter decreases the parameter.

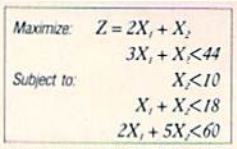
The parameter menu looks like this:

```
Drive      8
Printer    4
Second     7
Columns    1
Width      80
Returns    1
Indent     5
Length     52
Justify    Left
Feed       Tractor
Header
Title
Name

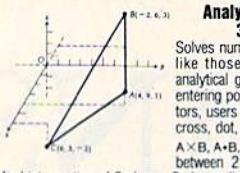
Press RETURN to print Q to quit
```

Following are the explanations of each of the menu options.

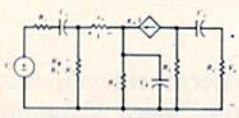
3 TECHNICAL PROGRAMS



Linear Programmer
Solves linear programming problems of up to 50 variables and 35 constraints. Systems may be restricted by constraints of *equality, less than or greater than*, (different types may appear in the same problem). Objective (Z function) may be maximized or minimized. Computer displays solution (in example at left, Z=31, $X_1=13$, $X_2=5$). Initial and final tableaus. Special command for easy entry of sparse constraints.



Analytical Geometry in 3 Dimensions
Solves numerical geometry problems like those found in college level analytical geometry text books. After entering points, lines, planes and vectors, users may then calculate. Vector cross, dot, triple and scaler products. A×B, A•B, A×B•C, sA; find the angle between 2 lines, vectors or planes; find intersection of 3 planes, 2 planes, line and a plane; find a plane through 3 points, a point and a line, point and normal point and parallel plane, or perform 18 other geometric calculations. Entries made and answers displayed in users choice of several methods, including symetric equation, parametric equation, multiple points, direction and magnitude. (NOT A GRAPHICS PROGRAM)



Electronics: AC DC Circuit Analysis Programs
Program computes general numeric solution to electronic circuit of up to 40 nodes and 63 branches. Branches may contain resistors, capacitors, inductors, current sources, voltage sources or 4 types of controlled sources. Computer displays node voltages, branch voltages, currents, powers and power factors. Step function of branch parameters or frequency with graphic display of results. Menu controlled and user friendly.

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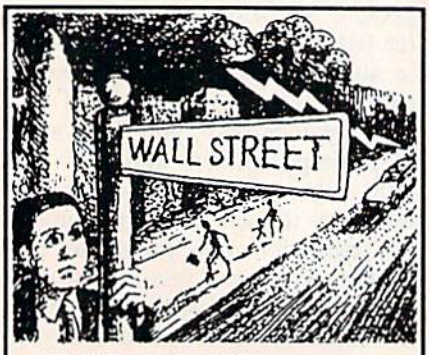

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◆**Drive.** This option lets you choose the device number of the disk drive that contains the document file. This is useful if you need to use a second disk drive with Speed Columns. Valid values are 8–11.

◆**Printer.** This option allows you to set the device number of your printer. (The device number can be found in your printer manual.) Valid values are 3–5. A value of 3 prints to the screen to give you a preview of what the document will look like on paper. Values of 4 or 5 send the output to the printer.

◆**Second.** This option allows you to specify the secondary address used when the printer channel is opened. Commodore printers use a secondary address of 7 (the default value) to print in uppercase/lowercase mode. Some printer interfaces use a secondary address of 7 to indicate near-letter-quality (NLQ) mode. Check the manual that came with your printer or printer interface for more information. Second must be a value in the range 0–15.

◆**Columns.** This option is used to select the number of vertical columns on the page. Be careful with this setting. Printing your document in multiple columns can yield a very professional-looking document, but too many columns make the page look ragged. You can print in 1–7 columns.

◆**Width.** This option allows you to set the right margin of your printer. Width can range from Indent+20 to 200 (see the discussion of Indent below). Most printers are limited to a line length of 80 in normal printing mode and 132 in condensed mode. Setting the width too large will cause each line to wrap around to the beginning of the next line.

◆**Returns.** This option allows you to specify the number of carriage returns to be printed at the end of each line. Returns can be used to provide single-, double-, or triple-spacing in your documents.

◆**Indent.** This option lets you select the left margin for your printer. Values can range from 0 to Width −20. This means that the minimum line length is 20 characters.

◆**Length.** This option allows you to set the length of the paper as measured in lines. A setting of 52 lines is typical.

◆**Justify.** Justify allows you to set left, right, or center justification. Justify tells Speed Columns whether to print the text against the left or right sides of each column or to center it within the column. Left justification, the default, provides the most readable printout. (*SpeedScript* normally uses left justification.)

◆**Feed.** This option is the paper-feed setting. It toggles between tractor and hand feed. Selecting hand feed will cause Speed Columns to pause after each page. Press any key to continue.

◆**Header.** This option lets you set the page header. The header is a line of text printed at the top of each page (beginning with page 2). It can contain up to 32 characters. To enter the header, press H, type your text, and then press RETURN. Speed Columns appends the page number to the end of your header, so you must leave an extra space at the end of the header to separate the two. The header is always left-justified and may contain only alphanumeric characters.

◆**Title.** This option allows you to set a title for your document. The title is a single line of text that Speed Columns centers at the top of the first page. To enter the title, press T, type your text, and press RETURN. As with the header, the title may contain only alphanumeric characters.

◆**Name.** This option allows you to set the name of the author of the document. Press N to enter the name. Name may contain only alphanumeric characters.

The header, title, and name are optional. If you choose not to use them, your document will begin printing in columns at the top of the page.

When Speed Columns has finished printing, you'll be asked whether you want to print another copy. Press Y to return to the first menu or N to exit to BASIC.

Note: Because Speed Columns formats the text, your file should not contain any *SpeedScript* format commands (the commands entered with CTRL-3 or CTRL-£). If formatting commands are included, they will be ignored, and any text following them will be printed as is.

See program listing on page 74.

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Screenius

Tim Gerchmez

Writing programs that use nicely designed text screens or menus can be a chore. The necessary color codes and cursor-control codes can be baffling. "Screenius" is a utility that makes it easy to design and save multicolored menus, text game screens, and even notes to yourself.

Screenius allows you to store and retrieve as many as four text screens (including color information) at the touch of a function key. Screenius also includes support routines that let you save, load, print, and display text screens either in direct mode or from within a BASIC program.

Getting Started

Program 1, "Screenius," is written in machine language. To type the program in, you'll need a copy of "MLX," the machine language entry program located elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: 0801
Ending address: 0C28

After you've typed in the program, save a copy to disk or tape before leaving MLX. Even though it's written in machine language, Screenius loads and runs like a normal BASIC program.

Program 2 is a note-pad program that shows the power of Screenius. It's written in BASIC, so you should enter it using "The Automatic Proofreader," located elsewhere in this issue.

Designing, saving, and loading colorful text screens is a snap with this utility for the 64.

Using Screenius

When you run Screenius, you'll see a brief message at the top of the screen. Type NEW and press RETURN. Screenius is robust—it will not be disabled by RUN/STOP-RESTORE. If you want to disable Screenius, type POKE 792,71:POKE 793,254, press RETURN, and then press RUN/STOP-RESTORE. To reactivate Screenius, type SYS 49152 and press RETURN. Then enter POKE 792,146:POKE 793,193 and press RETURN.

After you've run Screenius, design your text screen. Using Screenius is much like using BASIC's screen editor. Move the cursor with the cursor keys. Enter text or graphics characters anywhere you like. To change the color of the text, hold down either the Control or the Commodore key and then press a number key.

Use the function keys to store and load screens. Press f1 to store the current text screen as screen 0, f3 to store it as screen 1, f5 to store it as screen 2, and f7 to store it as screen 3. Press f2 to retrieve screen 0, f4 to retrieve screen 1, f6 to retrieve screen 2, and f8 to retrieve screen 3. (Note that the unshifted function keys store screens and the shifted function keys retrieve screens.) All the color information on the screen is stored along with the text.

Once you've saved a screen, you can use it in your own BASIC programs.

Calling for Support

Screenius supports the following routines, which are called with SYS commands from BASIC.

SAVE. This routine saves the text screens to disk. The format for the SAVE routine is SYS 49648, "FILENAME". A copy of Screenius is saved along with the text screens—in other words, if you

want to load in text screens from BASIC and be able to use Screenius's routines, just load the screen file (LOAD "FILENAME",8,1).

LOAD. This routine loads screens saved with the SAVE routine. The format for the LOAD routine is SYS 49714,"FILENAME".

Normally, a BASIC program restarts after loading a binary file. A special feature of this routine is that you can use it to load binary files from within a BASIC program without having to worry about your program restarting. After the file has loaded, your program continues from the point where it had left off.

Print. The Print routine is used to print one of the four text screens. The format for the Print routine is SYS 49882,*screen number*. Valid screen numbers are 0–3.

Recall. Recall lets you display a screen from within a BASIC program without pressing any of the function keys. The format for the Recall routine is SYS 50032,*screen number*. Valid screen numbers are 0–3.

Store. The Store routine lets you store a screen from within a BASIC program without pressing a function key. The format for the Store routine is SYS 50045,*screen number*. Valid screen numbers are 0–3.

Fill color memory. This routine fills the current text screen with a color of your choice. The format for the Fill-color-memory routine is SYS 50058,*color number*. Valid color numbers are 0–15.

Fill screen memory. This routine fills the screen with the screen code of your choice. The format for the Fill-screen-memory routine is SYS 50098,*screen code*. Valid screen codes are 0–255.

Taking Notes

To give you an idea of how powerful and useful Screenius can be, try program 2, "Notepad." To use it, load and run Screenius, type NEW, and then load and run Notepad.

Notepad is a program you can use to make notes to yourself. Screen 0 is used as a help screen with instructions on how to use Notepad, leaving screens 1–3 for your work. Use the cursor and color-control keys to move about and design colorful notes. You can return to the help screen by pressing f1.

See program listings on page 78.

128 TEXT SORTER

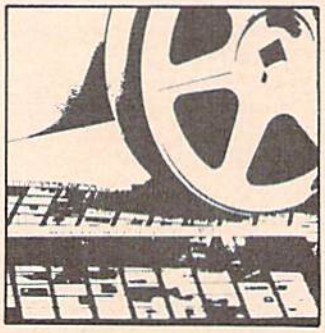
Bert Halverson, Jr.

Organize notes, recipes, collections, and more with this utility for the 128. A disk drive is required.

Computer users normally think of *sort* as meaning *to arrange in alphabetical order*, but it can also mean *to arrange by type or class*. "128 Text Sorter" combines BASIC with machine language to sort sequential text files according to labels that you insert into your text.

As an example, suppose you have a large volume of notes and want them grouped together by topic. This could take hours to do by hand with a word processor. With Text Sorter it takes fewer than three minutes to sort a 60,000-byte file into 25 categories. And since the original version of the file remains unchanged, you can rearrange the data over and over.

This Publication is available in Microform.



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Using the Program

Text Sorter is written in BASIC and uses machine language where extra speed is needed. The machine language is stored in DATA statements and POKEd into memory when the program is executed. These DATA statements are susceptible to typing errors, so be sure to use "The Automatic Proofreader," found elsewhere in this issue, to ensure that you enter the program correctly.

Text Sorter works only with sequential files. Word processors which save their files as program files—such as *SpeedScript*—cannot be used in conjunction with Text Sorter. However, the October 1987 issue, which contains *SpeedScript 128*, includes a file-conversion utility (program file to sequential file).

To get started, load the program and type RUN. There is a brief pause while the machine language is installed; then Text Sorter prompts you for the source filename. Enter the name of the file you want sorted. Next, it asks whether you would like the labels to be placed in the output file. Then you're given the option of sending the output to a new disk file, to the printer, or to the screen. Finally, Text Sorter gives you the option of listing the labels in the file to the screen or printer. If you don't remember which labels are in the file, use this option to get a list.

Once you've answered the questions and the file has been read, you're prompted to enter the labels in the order in which you want the text arranged. Type the label without the at sign (@)—the @ is used as a label identifier in the source file only. Enter the labels in the order in which you want them written to the output file. Press RETURN alone at the prompt to begin the sort.

For each label that you enter, Text Sorter searches the document. When an exact match is found, it outputs everything following the label until it encounters the next label (or a label-identifier character by itself). The search continues until it reaches the end of the file; then it starts over with the next label on your list. Labels can be excluded from the list or can be entered more than once. Leaving a label out of the list causes the text following the label to be excluded from the output. Including a label more than once causes the text to be printed once for each occurrence of the label.

The Source File

Text Sorter sorts according to label keys which you insert into your file. Each label must be on a line by itself and must begin with a label identifier. The identifier must be a unique character not used anywhere as part of your text. Here's an example:

```
@First Category

    Now is the time.

@Second Category

    The cow jumped.
```

Text Sorter recognizes the at sign (@) as the label identifier. You can change this by changing variable P$ in line 70 of the BASIC program.

Labels can be of any length and consist of virtually any characters—letters of the alphabet, numbers, full headings, abbreviations, and so on. Labels need not be in any special order. The same label can be inserted several times. If you precede separate sections of the file with the same label, the sections are printed one after the other in the output file.

128 Text Sorter reserves the English pound sign (£) as an end-of-file marker, so it must not be used as a label identifier or within your text. You can select another end-of-file marker by changing the variable E$ in line 70.

You may enter as many labels as you like. The only limitation is the amount of memory reserved for them—2303 bytes. If you exceed this limit, Text Sorter informs you that the last label entered has been voided. You're then asked if you'd like to continue without it.

A Note to Programmers

128 Text Sorter places as many as 62,960 bytes into the same part of bank 1 memory that BASIC normally uses to store variables. To avoid a conflict, line 20 moves the start of variable storage to 64010. If you make any changes to the program, keep in mind that certain changes, especially those which increase the number of variables, could cause the program to crash with an OUT OF MEMORY error.

See program listing on page 94.

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- 18 second full GCR Quick Nibbler!
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- 1581 Utility Pack!

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BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Speed Columns

See instructions in article on page 67 before typing in.

```
0801:0B 08 FF FF 9E 32 32 38 F2
0809:38 00 EE 08 FF FF 8F 22 D4
0811:0D 0D 0D 0D 0D 0D 0D 0D 21
0819:0D 0D 0D 0D 0D 0D 0D 0D 29
0821:0D 0D 0D 0D 0D 0D 0D 0E 32
0829:20 20 20 20 20 20 20 20 39
0831:20 20 20 20 B0 C0 C0 C0 2A
0839:C0 C0 C0 C0 C0 C0 C0 C0 49
0841:C0 C0 C0 AE 0D 20 20 20 2E
0849:20 20 20 20 20 B0 C0 C0 7D
0851:C0 BD C3 4F 50 59 52 49 74
0859:47 48 54 20 31 39 38 38 C2
0861:AD C0 C0 C0 AE 0D 20 20 A6
0869:20 20 20 20 20 20 20 DD C3 98
0871:CF CD D0 D5 D4 C5 21 20 74
0879:20 D0 55 42 4C 49 43 41 EB
0881:54 49 4F 4E 53 DD 0D 20 29
0889:20 20 20 20 20 20 20 AD 27
0891:C0 C0 AE 33 32 34 20 20 FD
0899:D7 2E 20 D7 45 4E 44 4F DD
08A1:56 45 52 B0 C0 C0 BD 0D 15
08A9:20 20 20 20 20 20 20 20 B9
08B1:20 20 20 AD AE C7 52 45 37
08B9:45 4E 53 42 4F 52 4F 2C 1D
08C1:20 CE C3 B0 BD 0D 20 20 9B
08C9:20 20 20 20 20 20 20 20 D9
08D1:20 20 AD C0 C0 C0 C0 C0 07
08D9:C0 C0 C0 C0 C0 C0 C0 C0 E9
08E1:C0 BD 0D 0D 0D 0D 0D 0D F7
08E9:0D 0D 0D 0D 00 00 00 20 56
08F1:92 16 4C 6F 0E CE 41 4D CC
08F9:45 3A 20 00 A9 93 20 D2 ED
0901:FF A9 00 85 C6 A2 17 A0 65
0909:00 18 20 F0 FF A9 00 AA 85
0911:A8 BD F6 08 F0 09 20 D2 05
0919:FF E8 4C 12 09 A0 00 20 FA
0921:CF FF 99 0B 17 C8 C9 0D 7B
0929:D0 F5 C0 02 B0 01 60 A9 4D
0931:14 20 D2 FF 88 98 A2 0B A6
0939:A0 17 20 BD FF AD 0A 17 23
0941:AE 0A 17 A0 00 20 BA FF 10
0949:20 C0 FF A2 17 A0 1F 86 C5
0951:FC 84 FB AE 0A 17 20 C6 21
0959:FF 20 CF FF 20 CF FF 20 CD
0961:CF FF A0 00 91 FB 20 EE 1B
0969:0C 20 B7 FF 29 40 F0 EF 9C
0971:A5 FB 8D 3E 16 A5 FC 8D B9
0979:3F 16 AD 0A 17 20 C3 FF C7
0981:20 CC FF A9 93 20 D2 FF 34
0989:A9 0F AE 0A 17 A0 0F 20 24
0991:BA FF A9 00 A8 AA 20 BD 24
0999:FF 20 C0 FF A2 17 A0 00 7E
09A1:18 20 F0 FF A2 0F 20 C6 3E
09A9:FF 20 E4 FF 20 D2 FF C9 76
09B1:30 D0 05 A9 01 8D 42 16 24
09B9:20 E4 FF 20 D2 FF C9 0D 4E
09C1:D0 F6 A9 0F 20 C3 FF 20 50
09C9:CC FF 20 13 16 A5 C5 C9 14
09D1:40 F0 FA A5 C5 C9 40 D0 A0
09D9:FA 60 AD 42 16 D0 01 60 B1
09E1:AD 3E 16 8D 40 16 AE 3F EC
09E9:16 8E 41 16 CE 3E 16 AD 7D
09F1:3E 16 C9 FF D0 01 CA 8E 90
09F9:3F 16 20 CC FF 20 FC 0C 88
0A01:A9 00 A0 FF A2 FF 20 BD 11
0A09:FF AD 99 15 AE 99 15 AC BF
0A11:9A 15 20 BA FF 20 C0 FF 69
0A19:AE 99 15 20 C9 FF A9 1F 50
0A21:85 FB A9 17 85 FC A9 00 11
0A29:8D 69 0D A9 00 8D A4 0C 26
0A31:AD 69 0D D0 0B 20 F8 0D FC
0A39:A9 0D 20 D2 FF 4C 7E 0A CE
0A41:AE A2 0D E0 00 F0 09 A9 84
0A49:20 20 D2 FF CA 4C 44 0A E9
0A51:AD 9F 0D F0 0E A2 00 BD 8D
0A59:6A 0D 20 D2 FF E8 EC A0 35
0A61:0D 90 F4 A9 00 AE 69 0D F3
0A69:E8 20 43 16 20 46 0E EA E4
0A71:EA EA EA EA EA EA EA 85
0A79:EA EA EA EA EA 20 B5 0C 19
0A81:AD CB 0C 8D 0C 0D 20 15 A3
0A89:0C AE A2 0D 8E 0B 0D A2 D1
0A91:00 8E A3 0C AE A3 0C BD 58
0A99:A5 0C 85 FB BD AD 0C 85 36
0AA1:FC AD 0B 0D AA 18 6D 0C 6E
0AA9:0D 8D CB 0C 20 CC 0C A4 D2
0AB1:FC CC 3F 16 90 0D F0 02 5D
0AB9:B0 07 A4 FB CC 3E 16 90 58
0AC1:02 A9 20 9D 34 03 20 EE FB
0AC9:0C E8 EC CB 0C 90 DD AC 83
0AD1:0C 0D 88 AE 0B 0D BD 34 67
0AD9:03 C9 0D F0 20 88 E8 EC 74
0AE1:CB 0C 90 F2 A0 00 AE CB 4E
0AE9:0C CA BD 34 03 C9 20 F0 22
0AF1:0C C8 CA EC 0B 0D D0 F2 87
0AF9:A0 00 4C 09 0B A9 20 9D 55
0B01:34 03 E8 EC CB 0C 90 F5 83
0B09:84 FD AE A3 0C A5 FC 9D 7F
0B11:AD 0C A5 FB 38 E5 FD 9D 68
0B19:A5 0C B0 03 DE AD 0C AD BE
0B21:5D 0D F0 03 20 0D 0D AD 74
0B29:0B 0D 18 6D 0C 0D 8D 0B 9C
0B31:0D 18 6D 0C 0D 8D CB 0C 84
0B39:EE A3 0C AE A3 0C EC 12 55
0B41:0C B0 03 4C 95 0A A2 00 C8
0B49:BD 34 03 20 D2 FF E8 EC 03
0B51:10 0C 90 F4 AE 09 0D A9 31
0B59:0D 20 D2 FF E0 01 F0 04 49
0B61:CA 4C 58 0B 20 FC 0C AC 65
0B69:A3 0C AD A2 0D 8D 0B 0D F5
0B71:A9 00 8D A3 0C AD 0C 0D 84
0B79:8D CB 0C AE 09 0D EE A4 B4
0B81:0C E0 01 F0 04 CA 4C 7F 68
0B89:0B AE A4 0C EC 13 0C B0 A2
0B91:1A 4C 95 0A A0 A0 A0 A0 84
0B99:A0 A0 A0 A0 A0 A0 A0 A0 AF
0BA1:A0 A0 A0 A0 A0 A0 A0 A0 B7
0BA9:A0 A0 A0 98 AA BD AD 0C 89
0BB1:85 FC BD A5 0C 85 FB A5 EF
0BB9:FC CD 3F 16 90 26 F0 02 0C
0BC1:B0 07 A5 FB CD 3E 16 90 8A
0BC9:1B AD 99 15 20 C3 FF 20 8D
0BD1:CC FF A9 93 20 D2 FF AD B6
0BD9:40 16 8D 3E 16 AD 41 16 2B
0BE1:8D 3F 16 60 20 46 0E 20 AD
0BE9:46 0E 20 46 0E 20 46 0E 9A
0BF1:EE 69 0D AD A3 0D F0 06 8F
0BF9:A5 C5 C9 40 F0 FA A9 0D 65
0C01:20 D2 FF 20 D2 FF 20 D2 89
0C09:FF 20 D2 FF 4C 2C 0A 50 FA
0C11:00 01 34 00 EA A2 00 8E 60
0C19:A3 0C 8E A4 0C A5 FB 9D AE
0C21:A5 0C A5 FC 9D AD 0C A2 F1
0C29:00 20 CC 0C 9D 34 03 E8 50
0C31:20 EE 0C EC CB 0C 90 F1 07
0C39:20 6F 0C AE 09 0D EE A4 A8
0C41:0C E0 01 F0 04 CA 4C 3F E9
0C49:0C AE A4 0C EC 13 0C 90 C4
0C51:D6 A2 00 8E A4 0C EE A3 3D
0C59:0C AE A3 0C A5 FB 9D A5 56
0C61:0C A5 FC 9D AD 0C EC 12 EB
0C69:0C 90 BC 4C FC 0C AC CB 45
0C71:0C 88 A2 00 BD 34 03 C9 94
0C79:0D F0 19 88 E8 EC CB 0C 9E
0C81:90 F2 A0 00 AE CB 0C CA 3A
0C89:BD 34 03 C9 20 F0 05 C8 22
0C91:CA D0 F5 60 84 FD A5 FB 6B
0C99:38 E5 FD 85 FB B0 02 C6 CC
0CA1:FC 60 00 00 00 00 00 00 50
0CA9:00 00 00 00 00 00 00 00 C1
0CB1:00 00 00 00 A2 00 AD 10 4A
0CB9:0C 38 ED A2 0D E8 38 ED 38
0CC1:12 0C B0 F9 CA 8E CB 0C CF
0CC9:60 00 00 A0 00 B1 FB C9 A4
0CD1:20 B0 0C 18 69 40 C9 5F 68
0CD9:D0 12 A9 0D 4C ED 0C C9 E0
0CE1:40 90 09 18 69 20 C9 7B BB
0CE9:90 02 A9 20 60 E6 FB D0 69
0CF1:02 E6 FC 60 E6 FD D0 02 3D
0CF9:E6 FE 60 A9 20 A0 00 99 09
0D01:34 03 C8 C0 CC 90 F8 60 16
0D09:01 00 00 00 8E 0A 0D 20 7A
0D11:17 0D AE 0A 0D 60 AE CB 83
0D19:0C CA A0 00 BD 34 03 C9 8E
0D21:20 D0 10 BD 34 03 C9 20 BE
0D29:D0 0A C8 CA EC 0B 0D F0 92
0D31:02 B0 F0 60 AD 5C 0D D0 66
0D39:05 98 4A A8 F0 F5 AE CB 58
0D41:0C CA CA BD 34 03 E8 9D 66
0D49:34 03 CA EC 0B 0D F0 02 D6
0D51:B0 F0 A9 20 9D 34 03 88 83
0D59:D0 E4 60 00 00 C6 FB A5 D9
0D61:FB C9 FF D0 02 C6 FC 60 7E
0D69:00 00 00 00 00 00 00 00 83
0D71:00 00 00 00 00 00 00 00 8B
0D79:00 00 00 00 00 00 00 00 93
0D81:00 00 00 00 00 00 00 00 9B
0D89:00 00 00 00 00 00 00 00 A3
0D91:00 00 00 00 00 00 00 00 AB
0D99:00 00 00 00 00 00 00 00 B3
0DA1:00 05 00 00 00 00 00 00 FC
0DA9:00 00 00 00 00 00 00 00 C3
0DB1:00 00 00 00 00 00 00 00 CB
0DB9:00 00 00 00 00 00 00 00 D3
0DC1:00 00 00 00 00 00 00 00 DB
0DC9:00 00 00 00 00 00 00 00 E3
0DD1:00 00 00 00 00 00 00 00 EB
0DD9:00 00 00 00 00 00 00 00 F3
0DE1:00 00 00 00 00 00 00 00 FB
0DE9:00 00 00 00 00 00 00 00 04
0DF1:00 00 00 00 00 00 00 AD B9
0DF9:A5 0D F0 23 20 5F 0E ED 03
0E01:A4 0D 20 68 0E E0 00 F0 22
0E09:06 20 55 0E 4C 06 0E A2 F4
0E11:00 BD A6 0D 20 5B 0E EC B9
0E19:A4 0D 90 F5 20 46 0E AD 20
0E21:CF 0D D0 01 60 20 5F 0E E2
0E29:ED CE 0D 20 68 0E E0 00 D0
0E31:F0 06 20 55 0E 4C 2F 0E AE
0E39:A2 00 BD D0 0D 20 5B 0E 19
0E41:EC CE 0D 90 F5 A9 0D 20 C2
0E49:D2 FF 20 D2 FF EE A4 0C 11
0E51:EE A4 0C 60 A9 20 CA 4C 45
0E59:D2 FF E8 4C D2 FF AD 10 C2
0E61:0C 38 ED A2 0D 38 60 4A CD
0E69:18 6D A2 0D AA 60 20 A7 D0
0E71:16 A9 00 8D 42 16 8D 9F 01
0E79:0D 8D A0 0D 8D CF 0D 8D B7
0E81:CE 0D 8D A5 0D 8D A4 0D 49
0E89:A5 C5 C9 40 D0 FA 20 BD 97
0E91:15 A5 C5 C9 2A D0 06 20 B7
0E99:FD 08 4C 89 0E C9 29 D0 93
0EA1:03 4C D0 0E C9 3E D0 E9 20
0EA9:A9 00 85 C6 4C 9B 16 50 05
0EB1:12 05 13 13 20 D2 C5 D4 58
0EB9:D5 D2 CE 20 14 0F 20 10 7E
0EC1:12 09 0E 14 20 D1 20 14 C8
0EC9:0F 20 11 15 09 14 00 A5 27
0ED1:C5 C9 40 D0 FA A9 93 20 1E
0ED9:D2 FF A9 0E 20 D2 FF A9 6B
0EE1:08 20 D2 FF A2 00 BD B0 A5
0EE9:0E F0 07 9D C0 07 E8 4C 44
0EF1:E7 0E 20 6A 0F 20 D7 0F E7
0EF9:20 37 10 20 A4 10 20 09 A6
0F01:11 20 6E 11 20 BB 11 20 C0
0F09:23 12 20 8B 12 20 36 13 8A
0F11:20 02 14 20 AB 14 20 54 86
0F19:15 A5 C5 C9 01 D0 13 A9 9B
0F21:93 20 D2 FF A2 17 A0 00 1E
0F29:18 20 F0 FF 20 DB 09 4C 48
0F31:9B 15 C9 3E D0 03 4C 89 34
0F39:0E C9 14 D0 59 AD 8D 02 FE
0F41:F0 0D CE 12 0C D0 17 A9 91
0F49:07 8D 12 0C 4C 5F 0F EE 3E
0F51:12 0C AD 12 0C C9 08 90 7A
0F59:05 A9 01 8D 12 0C 20 6A C8
0F61:0F A0 00 20 90 15 4C 1A BC
0F69:0F A0 00 A2 09 18 20 F0 3B
```

```
0F71:FF A2 00 BD 8E 0F F0 07 AD
0F79:20 D2 FF E8 4C 74 0F A9 E6
0F81:00 AE 12 0C 20 43 16 A9 32
0F89:20 20 D2 FF 60 C3 4F 4C 17
0F91:55 4D 4E 53 20 00 C9 09 4A
0F99:F0 03 4C 04 10 AD 8D 02 0F
0FA1:F0 16 CE 10 0C AD A2 0D 02
0FA9:18 69 14 CD 10 0C 90 1B 7A
0FB1:A9 C8 8D 10 0C 4C CC 0F C3
0FB9:EE 10 0C AD 10 0C C9 C9 BD
0FC1:90 09 AD A2 0D 18 69 14 F9
0FC9:8D 10 0C 20 D7 0F A0 40 B2
0FD1:20 90 15 4C 1A 0F A0 00 D9
0FD9:A2 0A 18 20 F0 FF A2 00 9D
0FE1:BD FB 0F F0 07 20 D2 FF 2D
0FE9:E8 4C E1 0F A9 00 AE 10 77
0FF1:0C 20 43 16 A9 20 20 D2 C8
0FF9:FF 60 D7 49 44 54 48 20 E3
1001:20 20 00 C9 11 F0 03 4C 74
1009:64 10 AD 8D 02 F0 0D CE AA
1011:09 0D D0 17 A9 03 8D 09 02
1019:0D 4C 2C 10 EE 09 0D AD BC
1021:09 0D C9 04 90 05 A9 01 6F
1029:8D 09 0D 20 37 10 A0 00 31
1031:20 90 15 4C 1A 0F A0 00 3B
1039:A2 0B 18 20 F0 FF A2 00 3F
1041:BD 5B 10 F0 07 20 D2 FF 86
1049:E8 4C 41 10 A9 00 AE 09 CD
1051:0D 20 43 16 A9 20 20 D2 AA
1059:FF 60 D2 45 54 55 52 4E 2B
1061:53 20 00 C9 21 F0 03 4C EE
1069:D1 10 AD 8D 02 F0 16 CE D3
1071:A2 0D AD A2 0D C9 FF D0 66
1079:1F AD 10 0C 38 E9 14 8D 76
1081:A2 0D 4C 99 10 EE A2 0D E7
1089:AD 10 0C 38 E9 14 CD A2 67
1091:0D B0 05 A9 00 8D A2 0D 28
1099:20 A4 10 A0 40 20 90 15 B7
10A1:4C 1A 0F A0 00 A2 0C 18 15
10A9:20 F0 FF A2 00 BD C8 10 D8
10B1:F0 07 20 D2 FF E8 4C AE 28
10B9:10 A9 00 AE A2 0D 20 43 04
10C1:16 A9 20 20 D2 FF 60 C9 7E
10C9:4E 44 45 4E 54 20 20 00 13
10D1:C9 12 F0 03 4C 36 11 AD B4
10D9:8D 02 F0 12 CE 0A 17 AD FA
10E1:0A 17 C9 07 D0 17 A9 0B B7
10E9:8D 0A 17 4C FE 10 EE 0A 1B
10F1:17 AD 0A 17 C9 0C 90 05 60
10F9:A9 08 8D 0A 17 20 09 11 9F
1101:A0 80 20 90 15 4C 1A 0F BD
1109:A0 00 A2 06 18 20 F0 FF 53
1111:A2 00 BD 2D 11 F0 07 20 89
1119:D2 FF E8 4C 13 11 A9 00 B6
1121:AE 0A 17 20 43 16 A9 20 E7
1129:20 D2 FF 60 C4 52 49 56 6E
1131:45 20 20 20 00 C9 29 F0 6E
1139:03 4C 9B 11 AD 8D 02 F0 0D
1141:12 CE 99 15 AD 99 15 C9 6C
1149:02 D0 17 A9 05 8D 99 15 C4
1151:4C 63 11 EE 99 15 AD 99 99
1159:15 C9 06 90 05 A9 03 8D A4
1161:99 15 20 6E 11 A0 80 20 AC
1169:90 15 4C 1A 0F A0 00 A2 E1
1171:07 18 20 F0 FF A2 00 BD 78
1179:92 11 F0 07 20 D2 FF E8 EC
1181:4C 78 11 A9 00 AE 99 15 A7
1189:20 43 16 A9 20 20 D2 FF 11
1191:60 D0 52 49 4E 54 45 52 97
1199:20 00 C9 0D F0 03 4C EB ED
11A1:11 AD 8D 02 F0 06 CE 9A 61
11A9:15 4C B0 11 EE 9A 15 20 BC
11B1:BB 11 A0 80 20 90 15 4C CB
11B9:1A 0F A0 00 A2 08 18 20 46
11C1:F0 FF A2 00 BD E2 11 F0 3D
11C9:07 20 D2 FF E8 4C C5 11 E6
11D1:A9 00 AE 9A 15 20 43 16 0E
11D9:A9 20 20 D2 FF 20 D2 FF 30
11E1:60 D3 45 43 4F 4E 44 20 62
11E9:20 00 C9 2A F0 03 4C 53 77
11F1:12 AD 8D 02 F0 12 CE 13 DA
11F9:0C AD 13 0C C9 01 B0 17 7B
1201:A9 C7 8D 13 0C 4C 18 12 A2
1209:EE 13 0C AD 13 0C C9 C7 E9
1211:90 05 A9 00 8D 13 0C 20 E4
1219:23 12 A0 40 20 90 15 4C 25
1221:1A 0F A0 00 A2 0D 18 20 C3
1229:F0 FF A2 00 BD 4A 12 F0 46
1231:07 20 D2 FF E8 4C 2D 12 20
1239:A9 00 AE 13 0C 20 43 16 B6
1241:A9 20 20 D2 FF 20 D2 FF 99
1249:60 CC 45 4E 47 54 48 20 9A
1251:20 00 C9 22 F0 03 4C FE 0C
1259:12 AD 8D 02 F0 12 CE FD 2F
1261:12 AD FD 12 C9 01 B0 17 A5
1269:A9 03 8D FD 12 4C 80 12 89
1271:EE FD 12 AD FD 12 C9 04 79
1279:90 05 A9 01 8D FD 12 20 15
1281:8B 12 A0 80 20 90 15 4C C5
1289:1A 0F A0 00 A2 0E 18 20 30
1291:F0 FF A2 00 BD F4 12 F0 59
1299:07 20 D2 FF E8 4C 95 12 59
12A1:AD FD 12 C9 01 D0 0D A9 0A
12A9:00 8D 5D 0D 8D 5C 0D A2 48
12B1:00 4C D2 12 C9 02 D0 0F 6B
12B9:A9 01 8D 5D 0D A9 00 8D 17
12C1:5C 0D A2 07 4C D2 12 A9 97
12C9:01 8D 5D 0D 8D 5C 0D A2 E8
12D1:0E BD DF 12 F0 07 20 D2 40
12D9:FF E8 4C D2 12 60 CC 45 DF
12E1:46 54 20 20 00 C3 45 4E 2C
12E9:54 45 52 00 D2 49 47 48 66
12F1:54 20 00 CA 55 53 54 49 DE
12F9:46 59 20 00 01 C9 15 F0 E5
1301:03 4C 7E 13 AD 8D 02 F0 55
1309:12 CE A3 0D AD A3 0D C9 11
1311:FF D0 17 A9 02 8D A3 0D 83
1319:4C 2B 13 EE A3 0D AD A3 D1
1321:0D C9 02 D0 05 A9 00 8D E9
1329:A3 0D 20 36 13 A0 00 20 07
1331:90 15 4C 1A 0F A0 00 A2 AD
1339:0F 18 20 F0 FF A2 00 BD 48
1341:75 13 F0 07 20 D2 FF E8 AA
1349:4C 40 13 AD A3 0D D0 05 DA
1351:A2 00 4C 58 13 A2 08 BD C8
1359:65 13 F0 07 20 D2 FF E8 BA
1361:4C 58 13 60 D4 52 41 43 E1
1369:54 4F 52 00 C8 41 4E 44 04
1371:20 20 20 00 C6 45 45 44 CD
1379:20 20 20 20 00 C9 1D F0 10
1381:03 4C 27 14 A0 00 8C A0 21
1389:0D 84 C6 A2 10 8E 9F 0D 61
1391:18 20 F0 FF A2 00 BD F9 74
1399:13 F0 07 20 D2 FF E8 4C 1D
13A1:97 13 20 E4 FF F0 FB C9 30
13A9:0D F0 41 C9 14 F0 13 C9 AB
13B1:20 90 EF C9 60 90 25 C9 FF
13B9:C0 90 E7 C9 DB 90 1D 4C A5
13C1:A3 13 CE A0 0D AD A0 0D CF
13C9:C9 FF D0 08 A9 00 8D A0 78
13D1:0D 4C A3 13 A9 14 20 D2 E7
13D9:FF 4C A3 13 20 D2 FF EE F3
13E1:A0 0D AE A0 0D 9D 6A 0D 3C
13E9:E0 20 90 B6 A5 C5 C9 40 1E
13F1:D0 FA EE A0 0D 4C 1A 0F 04
13F9:C8 45 41 44 45 52 20 20 16
1401:00 A0 00 A2 10 18 20 F0 8D
1409:FF A2 00 BD F9 13 F0 07 BA
1411:20 D2 FF E8 4C 0C 14 A2 E9
1419:00 BD 6A 0D 20 D2 FF E8 04
1421:EC A0 0D 90 F4 60 C9 16 65
1429:F0 03 4C D0 14 A0 00 8C D0
1431:A4 0D 84 C6 A2 11 8E A5 08
1439:0D 18 20 F0 FF A2 00 BD 49
1441:A2 14 F0 07 20 D2 FF E8 83
1449:4C 40 14 20 E4 FF F0 FB 31
1451:C9 0D F0 41 C9 14 F0 13 67
1459:C9 20 90 EF C9 60 90 25 95
1461:C9 C0 90 E7 C9 DB 90 1D 2B
1469:4C 4C 14 CE A4 0D AD A4 93
1471:0D C9 FF D0 08 A9 00 8D 14
1479:A4 0D 4C 4C 14 A9 14 20 15
1481:D2 FF 4C 4C 14 20 D2 FF 28
1489:EE A4 0D AE A4 0D 9D A6 1A
1491:0D E0 20 90 B6 A5 C5 C9 27
1499:40 D0 FA EE A4 0D 4C 1A 70
14A1:0F D4 49 54 4C 45 20 20 CC
14A9:20 00 A0 00 A2 11 18 20 9F
14B1:F0 FF A2 00 BD A2 14 F0 38
14B9:07 20 D2 FF E8 4C B5 14 BF
14C1:A2 00 BD A6 0D 20 D2 FF EB
14C9:E8 EC A4 0D 90 F4 60 C9 E9
14D1:27 F0 03 4C 1A 0F A0 00 3D
14D9:8C CE 0D 84 C6 A2 12 8E 59
14E1:CF 0D 18 20 F0 FF A2 00 07
14E9:BD 4B 15 F0 07 20 D2 FF D3
14F1:E8 4C E9 14 20 E4 FF F0 A5
14F9:FB C9 0D F0 41 C9 14 F0 8D
1501:13 C9 20 90 EF C9 60 90 2C
1509:25 C9 C0 90 E7 C9 DB 90 08
1511:1D 4C F5 14 CE CE 0D AD 56
1519:CE 0D C9 FF D0 08 A9 00 21
1521:8D CE 0D 4C F5 14 A9 14 93
1529:20 D2 FF 4C F5 14 20 D2 EF
1531:FF EE CE 0D AE CE 0D 9D 2A
1539:D0 0D E0 20 90 B6 A5 C5 9D
1541:C9 40 D0 FA EE CE 0D 4C 43
1549:1A 0F CE 41 4D 45 20 20 12
1551:20 20 00 A0 00 A2 12 18 64
1559:20 F0 FF A2 00 BD 4B 15 9C
1561:F0 07 20 D2 FF E8 4C 5E 91
1569:15 A2 00 BD D0 0D 20 D2 70
1571:FF E8 EC CE 0D 90 F4 60 55
1579:A0 A0 A0 A0 A0 A0 A0 A0 A3
1581:A0 A0 A0 A0 A0 A0 A0 A0 AB
1589:A0 A0 A0 A0 A0 A0 A0 A2 B5
1591:00 CA D0 FD 88 D0 FA 60 46
1599:04 07 A2 00 BD FD 15 F0 DC
15A1:07 20 D2 FF E8 4C 9D 15 7A
15A9:A5 C5 C9 19 D0 03 4C 89 97
15B1:0E C9 27 D0 F3 A9 00 85 13
15B9:C6 4C 9B 16 A2 00 BD CC 8C
15C1:15 F0 07 20 D2 FF E8 4C 4A
15C9:BF 15 60 93 D0 52 45 53 0C
15D1:53 20 CC 20 54 4F 20 4C B5
15D9:4F 41 44 0D 20 20 20 20 37
15E1:20 20 D0 20 54 4F 20 50 B0
15E9:52 49 4E 54 20 20 20 20 80
15F1:20 20 D1 20 54 4F 20 51 E1
15F9:55 49 54 00 93 D0 52 49 79
1601:4E 54 20 41 4E 4F 54 48 22
1609:45 52 3F 20 3C D9 2F CE CC
1611:3E 00 A2 00 BD 22 16 F0 44
1619:07 20 D2 FF E8 4C 15 16 E3
1621:60 0D D0 D2 C5 D3 D3 20 4D
1629:C1 CE D9 20 CB C5 D9 20 70
1631:D4 CF 20 C3 CF CE D4 C9 29
1639:CE D5 C5 00 00 00 00 00 FA
1641:00 00 A9 30 8D A4 16 8D 5E
1649:A5 16 8D A6 16 8A A8 F0 07
1651:1D A2 02 FE A4 16 BD A4 82
1659:16 C9 3A 90 0D A9 30 9D 60
1661:A4 16 CA E0 FF D0 EC 4C 36
1669:9B 16 88 4C 50 16 A2 00 DE
1671:AD A4 16 C9 30 F0 05 20 6C
1679:D2 FF A0 01 AD A5 16 C9 2D
1681:30 D0 04 C0 01 D0 03 20 F7
1689:D2 FF AD A6 16 20 D2 FF 16
1691:60 78 A5 01 29 FE 85 01 22
1699:58 60 78 A5 01 09 01 85 27
16A1:01 58 60 30 30 30 A9 0E 17
16A9:20 D2 FF A9 08 20 D2 FF 9B
16B1:A9 97 20 D2 FF A9 0F A0 2F
16B9:00 99 00 D8 99 00 D9 99 F3
16C1:00 DA 99 00 DB C8 D0 F1 6D
16C9:A9 00 8D 20 D0 8D 21 D0 4E
16D1:60 A0 A0 A0 A0 A0 A0 A0 DD
16D9:A0 A0 A0 A0 A0 A0 A0 A0 06
16E1:A0 A0 A0 A0 A0 A0 A0 A0 0E
16E9:A0 A0 A0 A0 A0 A0 A0 A0 16
16F1:A0 A0 A0 A0 A0 A0 A0 A0 1E
16F9:A0 A0 A0 A0 A0 A0 A0 A0 26
1701:A0 A0 A0 A0 A0 A0 A0 A0 2F
1709:A0 08 00 00 00 00 00 00 89
1711:00 00 00 00 00 00 00 00 3F
1719:00 00 00 00 00 00 00 00 47
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

The *GEOS* Column

Article on page 59.

```
;*****************************************
;                ExHdr
;*****************************************
.if         Pass1                       ;include only on
.include    geosSym                     ;first pass
.endif
            .header                     ;start of header
            .word     0                 ;always zero
            .byte     3                 ;width (bytes)
            .byte     21                ;height (scanlines)
```

```
            .byte     $80 | USR         ;CBM file type
            .byte     APPLICATION       ;Geos file type
            .byte     SEQUENTIAL        ;Geos struct. type
            .word     ProgStart         ;start address
            .word     $3ff              ;end address
            .word     ProgStart         ;init address
            .byte     "Example      V1.0",0,0,0,$00
                      ;permanent filename: 12 characters,
                      ;version number: 4 characters,
                      ;3 zeroes, the 40/80 column flag.
            .byte     "Freddy Freeloader  ",0 ;author name
;end of header which is checked for accuracy
            .block    160-117           ;skip 43 bytes...
            .byte     "GeoProgrammer example",0
            .endh
;*****************************************
;               Example Program
;*****************************************
.if         Pass1                       ;include during
.include    geosSym                     ;first pass
.include    geosMac
.endif
BufLen      =         16                ;input buf. length
.psect      ;start program code (linker will assign address)
ProgStart:  LoadB     dispBufferOn,(ST_WR_FORE|ST_WR_BACK)
            LoadW     r0,ClearScreen    ;point to clear
            jsr       GraphicsString    ;screen string
            LoadW     r0,IconTable      ;point to def.
            jsr       DoIcons           ;draw the icons
            rts
DoIcon1:    lda       #0                ;turn off the icon
            sta       Ptr_Icon1
            sta       Ptr_Icon1+1
            LoadW     r0,#ClearScreen   ;clear the screen
            jsr       GraphicsString
            LoadW     r0,#MenuTable     ;turn on menus
            lda       #1
            jsr       DoMenu
            LoadW     keyVector,DoKey   ;set key routine
            rts                         ;return to geos
DoAbout:    jsr       GotoFirstMenu     ;roll up menu
            LoadW     r0, AboutTable    ;ptr to DB struct
            jsr       DoDlgBox          ;display DB
            rts                         ;return to geos
DoQuit:     jsr       GotoFirstMenu
            jmp       EnterDeskTop      ;return to deskTop
DoKey:      LoadW     r0,DrawBox        ;draw box for
            jsr       GraphicsString    ;input
            LoadW     r0,InTxt          ;print prompt
            LoadB     r1H,106           ;y position
            LoadW     r11,97            ;x position
            jsr       PutString
            LoadW     keyVector,Fix     ;go when done
            LoadW     r0,Buf            ;ptr to inp buf
            LoadB     r1L,0             ;clear flags
            LoadB     r1H,115           ;y position
            LoadB     r2L,BufLen        ;# chars to input
            LoadW     r11,97            ;x position
            jmp       GetString         ;input the string
Fix:        LoadW     keyVector,DoKey   ;restore vector
            lda       #2                ;set pattern to
            jsr       SetPattern        ;checkerboard
            jsr       i_Rectangle       ;draw filled rect.
            .byte     90,130            ;top and bottom
            .word     86,226            ;left and right
            rts
ClearScreen: .byte    NEWPATTERN,2      ;set new pattern
            .byte     MOVEPENTO         ;move pen to:
            .word     0                 ;top left corner
            .byte     0
            .byte     RECTANGLETO       ;draw filled
            .word     319               ;rectangle to
            .byte     199               ;bottom right
            .byte     NULL              ;end of table
DrawBox:    .byte     NEWPATTERN,0      ;pattern to white
            .byte     MOVEPENTO         ;pen to top left
            .word     86                ;x
            .byte     90                ;y
            .byte     RECTANGLETO       ;draw filled rect.
            .word     226               ;to lower right
            .byte     130
            .byte     NEWPATTERN,1      ;pattern to black
            .byte     MOVEPENTO         ;pen to upper left
            .word     86                ;x position
            .byte     90                ;y position
            .byte     FRAME_RECTO       ;draw rect. to
            .word     226               ;lower right
            .byte     130,NULL          ;end of table
InTxt:      .byte     "So you want to type, eh?",NULL
Buf:        .block    BufLen+1          ;input buffer
MenuTable:  .byte     0,14              ;top and bottom
            .word     0,49              ;left and right
            .byte     2 | HORIZONTAL    ;# items/type
            .word     GeosText          ;ptr to text
            .byte     VERTICAL          ;type of menu
            .word     GeosSubMenu       ;menu struct ptr
            .word     FileText          ;ptr to text
            .byte     VERTICAL          ;type of menu
            .word     FileSubMenu       ;menu struct ptr
GeosSubMenu: .byte    15,29             ;top and bottom
            .word     0,85              ;left/right
            .byte     1 | VERTICAL      ;# items/type
            .word     AboutText         ;pointer to text
            .byte     MENU_ACTION       ;type of action
            .word     DoAbout           ;ptr to handler
FileSubMenu: .byte    15,29             ;top and bottom
            .word     29,54             ;left and right
            .byte     1 | VERTICAL      ;# items/type
            .word     QuitText          ;pointer to text
            .byte     MENU_ACTION       ;type of action
            .word     DoQuit            ;ptr to handler
GeosText:   .byte     "geos",0
FileText:   .byte     "file",0
AboutText:  .byte     "Example info",0
QuitText:   .byte     "QUIT",0
IconTable:  .byte     1                 ;number of icons
            .word     0                 ;mouse x & y
            .byte     0                 ;when done
Ptr_Icon1:  .word     Icon1Picture      ;ptr to bitmap
            .byte     15                ;x position(bytes)
            .byte     80                ;y (scanlines)
            .byte     ICON_1_WIDTH      ;width (bytes)
            .byte     ICON_1_HEIGHT     ;height (scanlines)
            .word     DoIcon1           ;ptr to handler
Icon1Picture:
            ;assembler generates bitmap data
```

```
            ICON_1_WIDTH = picW           ;assembler sets
            ICON_1_HEIGHT = picH          ;picW & picH
AboutTable: .byte     DEF_DB_POS|1      ;standard DB
                                        ;w/ pattern #1
            .byte     DBTXTSTR          ;display string
            .byte     28,22             ;x & y offset
            .word     DBTxt1            ;pntr to text
            .byte     DBTXTSTR          ;display string
            .byte     24,49             ;x & y offset
            .word     DBTxt2            ;pntr to text
            .byte     DBTXTSTR          ;display string
            .byte     32,62             ;x & y offset
            .word     DBTxt3            ;pntr to text
            .byte     DBTXTSTR          ;display string
            .byte     73,75             ;x & y offset
            .word     DBTxt4            ;pntr to text
            .byte     DBSYSOPV          ;return on click
            .byte     NULL              ;end of DB
DBTxt1:     .byte     BOLDON,"Example Of A Dialog Box"
            .byte     PLAINTEXT,NULL
DBTxt2:     .byte     "Clicking anywhere on the screen",NULL
DBTxt3:     .byte     "will cause this dialog box to ",NULL
DBTxt4:     .byte     "disappear!",NULL
;*****************************************
;                Ex.lnk
;*****************************************
.output     Example                   ;output file
.header     ExHdr.rel                 ;file containing header block
.seq                                  ;this is a sequential application
.psect      $0400                     ;program code starts at $0400
.ramsect    $5000                     ;data area starts at $5000
Ex.rel                                ;file containing relocatable
                                      ;code from GeoAssembler
```

BEFORE TYPING . . .

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Computag

Article on page 56.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
SR 20 POKE53280,6:POKE53281,6:
      PRINT"{CLR}{CYN}
      {2 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
SR 40 FORI=1TO345:READA:X=X+A:
      NEXT:IFX<>34871THENPRINT
      "DATA STATEMENT ERROR":S
      TOP
DJ 50 RESTORE
RM 60 ONLO+1GOTO320,630
DR 70 IFSX(1)=SX(2)ANDSY(1)=SY
      (2)THEN1010
FG 80 IFK$<>""ANDPL=2THENPL=1:
      GOTO150
QK 90 IFLM<MAANDMA<97THENPOKEK
      A(INT(MA)),160:LM=LM+1:P
      OKE254,0:POKE255,3:GOTO9
      0
QG 100 MA=MA+.04:IFMA>97THENPO
       KE173,0:POKEKA(97),160:
       GOTO1310
QD 110 X=PEEK(653):GETK$:IF(AS
       C(K$+CHR$(0))AND127)<>A
       1ANDX=0THEN90
CK 120 PL=1:MA=MA+.25:IFX>0THE
       NPL=2
GS 130 E(1)=PEEK((40*DN(1)+102
       4+AC(1))):E(2)=PEEK((40
       *DN(2)+1024+AC(2))):GOT
       O150
AM 140 GOTO1010
CF 150 PI=(E(PL)-128)/4+1
HJ 160 POKE254,PL*16:POKE255,1
       5:ONPIGOTO180,210,250,2
       80
DP 170 REM ** UP **
CM 180 IFSY(PL)-16<69THEN70
ER 190 DN(PL)=DN(PL)-2:SY(PL)=
       SY(PL)-16:GOSUB1110:GOS
       UB300:GOTO70
EK 200 REM ** LEFT **
MX 210 IFA(PL)=1THENSX(PL)=SX(
       PL)+255
GJ 220 IFSX(PL)-16<57THEN70
PQ 230 AC(PL)=AC(PL)-2:SX(PL)=
       SX(PL)-16:GOSUB1110:GOS
       UB300:GOTO70
GF 240 REM ** DOWN **
EQ 250 IFSY(PL)+16>213THEN70
CD 260 DN(PL)=DN(PL)+2:SY(PL)=
       SY(PL)+16:GOSUB1110:GOS
       UB300:GOTO70
QE 270 REM ** RIGHT **
BA 280 IFSX(PL)+16>249THEN70
SC 290 AC(PL)=AC(PL)+2:SX(PL)=
       SX(PL)+16:GOSUB1110:GOS
       UB300:GOTO70
GM 300 IFPL=CHTHENSC(PL)=SC(PL
       )+1
QJ 310 PRINT"{HOME}{6 DOWN}
       {RVS}"SPC(32)SC(1)" ":P
       RINT"{9 DOWN}{RVS}"SPC(
       32)SC(2)" ":RETURN
FK 320 PA$="PLAYER":POKE53269,
       0:PRINT"{DOWN}":GOSUB14
       50
AC 330 PRINT"{3 DOWN}{CYN}
       {3 SPACES}PLAYER 1'S KE
       Y{WHT}{2 SPACES}"+CHR$(
       142)+CHR$(8);:GOSUB1430
       :P1$=P$:PRINTP$
BF 340 PRINT"{2 DOWN}{CYN}
       {3 SPACES}PLAYER 2 USES
        {CYN}SHIFT{WHT}"
KB 350 PRINT"{2 DOWN}{CYN}
       {3 SPACES}ARROW SPEED (
       1-5){2 SPACES}";
HS 360 GOSUB1430:IFP$<"1"ORP$>
       "5"ORP$=""THEN360
GD 370 AS=VAL(P$)*50:PRINTP$:P
       RINT:PRINTSPC(14)"
       {DOWN}{CYN}PLEASE WAIT"
PK 380 A1=ASC(P1$)AND127:GOSUB
       1260
GD 390 A$(1)="{RVS}@A{DOWN}
       {2 LEFT}BC{OFF}{UP}":A$
       (2)="{RVS}DE{DOWN}
       {2 LEFT}FG{OFF}{UP}":A$
       (3)="{RVS}HI{DOWN}
       {2 LEFT}JK{OFF}{UP}":A$
       (4)="{RVS}LM{DOWN}
       {2 LEFT}NO{OFF}{UP}"
FK 400 A$(5)="{RVS}{4}
       {2 SPACES}{DOWN}
       {2 LEFT}{2 SPACES}{OFF}
       {UP}"
SX 410 CH=1
MB 420 CL(1)=3:CL(2)=7:FORI=54
       272TO54296:POKEI,0:NEXT
       :POKE54278,192:POKE5427
       6,32
JD 430 POKE54276,33:POKE54296,
       15:GOSUB460:IFAGTHEN600
QC 440 GOTO570
KB 450 REM ** CHOOSE RANDOM PO
       SITION **
EP 460 IFRNTHEN480
JK 470 PO(1)=1:PO(2)=130:RN=1:
       GOTO500
CG 480 PO(1)=INT(130*RND(0))+1
HJ 490 PO(2)=INT(130*RND(1))+1
       :IFPO(1)=PO(2)THEN490
GF 500 FORMT=1TO2
MJ 510 SY(MT)=69:SX(MT)=57
EF 520 DN=13:FORI=1TO9:IFPO(MT
       )>DNTHENSY(MT)=SY(MT)+1
       6:DN=DN+13
AC 530 NEXT
EF 540 AB=DN-PO(MT):AC=12-AB:A
       A=16*AC+SX(MT)
PP 550 SX(MT)=AA
QE 560 AC(MT)=5+(2*AC):DN(MT)=
       1+(2*(DN/13)):NEXTMT:RE
       TURN
PX 570 ML$="{I}"+CHR$(8)+"{X}<
       "+CHR$(3)+"{2}XJ"+CHR$(
       16)+CHR$(248)+"L{B}{T}"
       :POKE835,0
EH 580 POKE836,208:POKE830,0:P
       OKE831,216:POKE828,0:PO
       KE829,56:POKE56334,0
JE 590 POKE1,51:ML$=ML$:SYS(PE
       EK(51)+256*PEEK(52)):PO
       KE1,55:POKE56334,1
GG 600 FORI=13312TO13312+128:R
       EADJ:POKEI,J:NEXT
JM 610 GOSUB1070
RX 620 FORI=0TO152:READJ:POKE4
       9152+I,J:NEXT
JF 630 IFPEEK(789)=0THEN650
BJ 640 POKE53265,27:POKE56333,
       127:POKE788,0:POKE789,1
       92:POKE53274,129
FE 650 POKE53272,28:POKE53280,
       11:POKE53281,11
MH 660 REM ** ↑ **
XM 670 DATA 255,128,128,128,12
       8,129,131,135
BP 680 DATA 255,1,1,1,1,129,19
       3,225
SD 690 DATA 129,129,129,129,12
       8,128,128,255
CH 700 DATA 129,129,129,129,1,
       1,1,255
QJ 710 REM ** ← **
BC 720 DATA 255,128,128,128,12
       8,130,134,143
EB 730 DATA 255,1,1,1,1,1,1,24
       1
SF 740 DATA 143,134,130,128,12
       8,128,128,255
QX 750 DATA 241,1,1,1,1,1,1,25
       5
GJ 760 DATA 255,128,128,128,12
       9,129,129,129
DA 770 DATA 255,1,1,1,129,129,
       129,129
KX 780 DATA 135,131,129,128,12
       8,128,128,255
AX 790 DATA 225,193,129,1,1,1,
       1,255
DC 800 REM ** /////// **
AR 810 DATA 255,128,128,128,12
       8,128,128,143
JH 820 DATA 255,1,1,1,1,65,97,
       241
JF 830 DATA 143,128,128,128,12
       8,128,128,255
QX 840 DATA 241,97,65,1,1,1,1,
       255
KK 850 POKE173,0
AH 860 PRINT"{CLR}":GOSUB870:G
       OTO920
SD 870 PRINT"{HOME}{4}";:FORI=
       1TO2:PRINT"{RVS}
       {40 SPACES}";
SA 880 NEXT:PRINT"{RVS}
       {4 SPACES}O{26 Y}P
       {7 SPACES}"
MK 890 FORI=1TO20:PRINT"{RVS}
       {4 SPACES}{H}{26 RIGHT}
       {N}{7 SPACES}":NEXT
GG 900 PRINT"{RVS}{4 SPACES}L
       {26 P}@{7 SPACES}"
FX 910 PRINT"{RVS}{39 SPACES}
       {HOME}{2 DOWN}":RETURN
CX 920 FORZ=1TO10:PRINT"
       {5 RIGHT}";:FORI=1TO13:
       X=INT(4*RND(1))+1
HB 930 PRINTA$(X);:NEXT:PRINT"
       {DOWN}"
BQ 940 NEXT
SR 950 FORI=1063TO2023STEP40:P
       OKEI,160:POKEI+54272,11
       :NEXT
FE 960 POKE53281,12
DD 970 GOSUB310:POKEV+21,255
AX 980 POKE172,0:POKE173,AS:PO
       KE160,256-AS
GE 990 GOTO70
HR 1000 REM ** PLAYER TAGGED *
        *
QE 1010 POKE173,0:POKEV+40,CL(
        CH):IFCH=1THENCH=2:HC=
        1:GOTO1030
XC 1020 CH=1:HC=2
PX 1030 CZ$=STR$(HC):PRINT"
        {HOME}{DOWN}"SPC(12)"P
        LAYER "CZ$" IS NOW IT"
        :GOSUB1440
HG 1040 PRINT"{HOME}{DOWN}"SPC
        (12)"{RVS}{4}
        {19 SPACES}"
GK 1050 FORI=1TO500:NEXT:POKEV
        +21,0:GOSUB460:GOSUB10
        90:GOTO970
GF 1060 REM ** SPRITE **
BF 1070 V=53248:POKE2042,13:PO
        KE2041,13
```

```
AC 1080 FORN=0TO62:READI:POKE8
        32+N,I:NEXT
XA 1090 POKEV+40,3
JS 1100 POKEV+41,7:POKE53275,7
KJ 1110 GOSUB1220
FF 1120 POKEV+2,SX(1):POKEV+3,
        SY(1)
SE 1130 POKEV+4,SX(2):POKEV+5,
        SY(2):RETURN
AS 1140 DATA0,0,0,0,0,0,0,0,0
GS 1150 DATA0,0,0,0,0,0,0,0,0
KB 1160 DATA0,0,0,0,0,0,127,24
        8
EK 1170 DATA0,127,248,0,127,24
        8,0,127
FK 1180 DATA248,0,127,248,0,12
        7,248,0
HP 1190 DATA127,248,0,127,248,
        0,127,248
DJ 1200 DATA0,127,248,0,127,24
        8,0,127
DX 1210 DATA248,0,0,0,0,0,0,0
SB 1220 A(1)=0:A(2)=0
SQ 1230 IFPEEK(V+16)=4ORPEEK(V
        +16)=6THENA(2)=1
BA 1240 IFPEEK(V+16)=2ORPEEK(V
        +16)=6THENA(1)=1
ES 1250 RETURN
EX 1260 DIMKA(101):KA(1)=1108:
        FORI=2TO21:KA(I)=KA(1)
        +40*(I-1):NEXT
EB 1270 KA(22)=1948:FORI=23TO4
        9:KA(I)=KA(22)+(I-22):
        NEXT
QD 1280 KA(50)=1974:FORI=51TO7
        0:KA(I)=KA(49)-40*(I-5
        0):NEXT
CS 1290 KA(71)=1135:FORI=72TO9
        7:KA(I)=KA(I-1)-1:NEXT
AA 1300 RETURN
KQ 1310 PRINT"{HOME}{DOWN}
        {5 RIGHT}";:IFGM=1THEN
        1340
KJ 1320 GM=1:PRINT"{HOME}
        {DOWN}"SPC(10)"ROUND 1
         OVER":GOSUB1440:GOSUB
        470:MA=0:LM=0:GOSUB870
RM 1330 GOSUB1120:PRINT"{HOME}
        {DOWN}{4 RIGHT}{RVS}
        {12 SPACES}":GOSUB310:
        GOTO980
ED 1340 PRINT"{CLR}"SPC(12)"
        {3 DOWN}{WHT}G A M E
        {3 SPACES}O V E R":POK
        E53280,6:POKE53281,6:P
        OKE53269,0
KP 1350 PRINT"{2 DOWN}{CYN}
        {6 SPACES}PLAYER ONE S
        CORED"SC(1)
QS 1360 PRINT"{2 DOWN}{YEL}
        {6 SPACES}PLAYER TWO S
        CORED"SC(2)
JC 1370 P$="1":IFSC(2)>SC(1)TH
        ENP$="2"
EP 1380 IFSC(1)<>SC(2)THENPRIN
        T"{2 DOWN}{1}PLAYER "P
        $" WINS BY"ABS(SC(1)-S
        C(2))"POINTS"
FD 1390 IFSC(1)=SC(2)THENPRINT
        SPC(10)"{2 DOWN}{6}IT'
        S A TIE GAME"
MP 1400 PRINT"{3 DOWN}{WHT}
        {6 SPACES}PRESS ANY KE
        Y TO PLAY AGAIN"
SX 1410 GOSUB1430
JK 1420 CLR:AG=-1:PRINT"{CLR}"
        :GOTO60
KB 1430 POKE198,0:WAIT198,1:GE
        TP$:RETURN
BD 1440 FORDELAY=1TO4000:NEXT:
        RETURN
RK 1450 PRINT"{WHT}{2 SPACES}U
        CCIUCCIUI{2 SPACES}UIU
        CCIUIUIUCCCCIUCCIUCCI"
SK 1460 PRINT"{2 SPACES}BUCKBU
        IBBJIUKBBUIBBBBBJCIUCK
        BUIBBUCK"
MA 1470 PRINT"{2 SPACES}BB
        {2 SPACES}BBBBBUIUIBBJ
        KBB--B{2 SPACES}BB
        {2 SPACES}BJKBBBUI"
FA 1480 PRINT"{2 SPACES}BJCIBJ
        KBBBJKBBBUCKBJKB
        {2 SPACES}BB{2 SPACES}
        BUIBBJKB"
PR 1490 PRINT"{2 SPACES}JCCKJC
        CKJK{2 SPACES}JKJK
        {2 SPACES}JCCK
        {2 SPACES}JK{2 SPACES}
        JKJKJCCK":RETURN
DA 1500 DATA 165,173,240,60,16
        5,162,197,172,208,54,1
        69,4,133,175,169,0
GX 1510 DATA 133,174,168,177,1
        74,201,128,144,10,201,
        144,176,6,105,4,41
PQ 1520 DATA 143,145,174,200,1
        92,231,208,16,165,175,
        201,7,144,10,165,172
KF 1530 DATA 24,101,173,133,17
        2,56,176,8,192,0,208,2
        15,230,175,208,211
BR 1540 DATA 165,255,48,14,198
        ,255,41,15,24,101,254,
        170,189,105,192,141
QG 1550 DATA 1,212,169,1,141,2
        5,208,169,0,141,18,208
        ,173,13,220,41
SM 1560 DATA 1,240,3,76,49,234
        ,76,188,254,0,128,104,
        88,76,68,62
PC 1570 DATA 56,52,49,47,45,44
        ,43,42,42,0,16,24,40,8
        ,16,32
BD 1580 DATA 48,24,32,48,64,4,
        8,16,24,0,122,0,80,0,5
        2,0,20,0,18,0,14,0,12,
        0,11
```

Screenius

See instructions in article on page 70 before typing in.

Program 1: Screenius

```
0801:19 08 0A 00 9E 32 30 37 36
0809:35 3A 8F 20 20 20 53 43 A1
0811:52 45 45 4E 49 55 53 00 6F
0819:00 00 A0 00 84 FB A9 C0 65
0821:85 FC A9 56 85 FD A9 08 4D
0829:85 FE A0 00 B1 FD 91 FB 74
0831:E6 FB D0 02 E6 FC E6 FD E4
0839:D0 02 E6 FE A5 FB C9 D0 80
0841:D0 EA A5 FC C9 C3 D0 E4 DC
0849:A9 92 8D 18 03 A9 C1 8D D5
0851:19 03 4C 00 C0 A9 93 20 2C
0859:D2 FF A0 00 B9 20 C0 F0 A7
0861:06 20 D2 FF C8 D0 F5 78 C4
0869:A9 4C 8D 14 03 A9 C1 8D 24
0871:15 03 58 60 EA 11 57 45 6D
0879:4C 43 4F 4D 45 20 54 4F E1
0881:20 53 43 52 45 45 4E 49 29
0889:55 53 0D 28 43 29 20 31 6D
0891:39 38 38 20 43 4F 4D 50 97
0899:55 54 45 21 20 50 55 42 53
08A1:4C 2E 20 0D 0D 46 31 2F 4B
08A9:46 33 2F 46 35 2F 46 37 1E
08B1:20 3D 20 53 54 4F 52 45 24
08B9:20 53 43 52 45 45 4E 53 6B
08C1:20 31 2D 34 0D 46 32 2F 2C
08C9:46 34 2F 46 36 2F 46 38 87
08D1:20 3D 20 52 45 43 41 4C 70
08D9:4C 20 53 43 52 45 45 4E 37
08E1:53 20 31 2D 34 0D 00 A2 15
08E9:00 86 FB A2 A0 86 FC C9 28
08F1:00 F0 11 AA A5 FB 18 69 C1
08F9:D0 85 FB A5 FC 69 07 85 CE
0901:FC CA D0 F0 60 A0 00 84 77
0909:FD A9 04 85 FE B1 FD 91 A9
0911:FB E6 FB D0 02 E6 FC E6 F3
0919:FD D0 02 E6 FE A5 FD C9 61
0921:E8 D0 EA A5 FE C9 07 D0 91
0929:E4 A0 00 84 FD A9 D8 85 EB
0931:FE B1 FD 91 FB E6 FB D0 4C
0939:02 E6 FC E6 FD D0 02 E6 32
0941:FE A5 FD C9 E8 D0 EA A5 9E
0949:FE C9 DB D0 E4 60 EA A9 FD
0951:36 85 01 A0 00 84 FD A9 C1
0959:04 85 FE B1 FB 91 FD E6 D2
0961:FB D0 02 E6 FC E6 FD D0 A4
0969:02 E6 FE A5 FD C9 E8 D0 2A
0971:EA A5 FE C9 07 D0 E4 A0 C4
0979:00 84 FD A9 D8 85 FE B1 93
0981:FB 91 FD E6 FB D0 02 E6 32
0989:FC E6 FD D0 02 E6 FE A5 EF
0991:FD C9 E8 D0 EA A5 FE C9 F4
0999:DB D0 E4 A9 37 85 01 60 37
09A1:EA A5 C5 C9 03 F0 0F C9 AB
09A9:04 F0 13 C9 05 F0 17 C9 DC
09B1:06 F0 1B 4C 31 EA A9 03 B6
09B9:20 92 C0 4C 7E C1 A9 00 AB
09C1:20 92 C0 4C 7E C1 A9 01 B4
09C9:20 92 C0 4C 7E C1 A9 02 BD
09D1:20 92 C0 AD 8D 02 C9 01 94
09D9:F0 06 20 B0 C0 4C 31 EA 79
09E1:20 FA C0 4C 31 EA EA EA 95
09E9:48 8A 48 98 48 A9 7F 8D CA
09F1:0D DD AC 0D DD 30 1C 20 70
09F9:02 FD D0 03 6C 02 80 20 63
0A01:BC F6 20 E1 FF D0 0C 20 CE
0A09:15 FD 20 A3 FD 20 18 E5 EB
0A11:A9 4C 8D 14 03 A9 C1 8D CF
0A19:15 03 A9 92 8D 18 03 A9 53
0A21:C1 8D 19 03 6C 02 A0 20 99
0A29:FD AE 20 9E AD 20 A3 B6 C1
0A31:48 A9 0A A2 08 A0 00 20 22
0A39:BA FF 68 A6 22 A4 23 20 2C
0A41:BD FF 4C C0 FF A9 01 8D FF
0A49:E1 C1 20 D2 C1 A2 0A 20 BC
0A51:C9 FF A9 00 85 FB A9 A0 8F
0A59:85 FC A9 00 20 D2 FF A9 9A
0A61:A0 20 D2 FF A0 00 A2 36 A8
0A69:86 01 B1 FB A2 37 86 01 F6
0A71:20 D2 FF E6 FB D0 02 E6 C6
0A79:FC A5 FC C9 C4 D0 E5 20 07
0A81:CC FF A9 0A 4C C3 FF A9 EC
0A89:00 8D E1 C1 20 D2 C1 A2 CB
0A91:0A 20 C6 FF 20 E4 FF 85 A5
0A99:FB 20 E4 FF 85 FC 20 E4 95
0AA1:FF A6 90 D0 0C A0 00 91 F2
0AA9:FB E6 FB D0 02 E6 FC D0 78
0AB1:ED 20 CC FF A9 0A 4C C3 30
0AB9:FF A0 00 B9 00 04 99 00 D4
0AC1:E0 B9 00 05 99 00 E1 B9 4F
0AC9:00 06 99 00 E2 B9 00 07 97
0AD1:99 00 E3 B9 00 D8 99 00 61
0AD9:E4 B9 00 D9 99 00 E5 B9 BE
0AE1:00 DA 99 00 E6 B9 00 DB D9
0AE9:99 00 E7 C8 D0 CD 60 78 4B
0AF1:A9 35 85 01 A0 00 B9 00 61
0AF9:E0 99 00 04 B9 00 E1 99 50
0B01:00 05 B9 00 E2 99 00 06 13
0B09:B9 00 E3 99 00 07 B9 00 A1
0B11:E4 99 00 D8 B9 00 E5 99 C0
0B19:00 D9 B9 00 E6 99 00 DA 55
0B21:B9 00 E7 99 00 DB C8 D0 7C
0B29:CD A9 37 85 01 58 60 38 32
0B31:20 F0 FF 86 B0 84 B1 20 17
0B39:64 C2 20 FD AE 20 9E B7 01
0B41:8A 20 92 C0 20 FA C0 AD 1F
0B49:18 D0 29 02 F0 04 A0 07 C4
0B51:D0 02 A0 00 A2 04 A9 0A E6
0B59:20 BA FF A9 00 20 BD FF C4
0B61:20 C0 FF A9 09 A2 03 A0 CB
0B69:00 20 BA FF A9 00 20 BD 2A
0B71:FF 20 C0 FF A9 13 20 D2 54
0B79:FF A9 00 85 FB 85 FC A2 E4
```

```
0B81:09 20 C6 FF 20 E4 FF 48 D9
0B89:20 CC FF A2 0A 20 C9 FF 71
0B91:68 20 D2 FF 20 CC FF E6 59
0B99:FB D0 02 E6 FC A5 C5 C9 64
0BA1:3F F0 0C A5 FB C9 E8 D0 19
0BA9:D6 A5 FC C9 03 D0 D0 A9 77
0BB1:09 20 C3 FF A9 0A 20 C3 46
0BB9:FF 20 9A C2 A6 B0 A4 B1 4A
0BC1:18 4C F0 FF EA 20 FD AE 97
0BC9:20 9E B7 8A 20 92 C0 4C 50
0BD1:FA C0 20 FD AE 20 9E B7 64
0BD9:8A 20 92 C0 4C B0 C0 20 62
0BE1:FD AE 20 9E B7 8A A0 00 B9
0BE9:99 00 D8 99 00 D9 99 00 1C
0BF1:DA 99 00 DB C8 D0 F1 A0 A7
0BF9:D9 B9 00 00 09 80 99 00 E8
0C01:00 C8 C0 F3 D0 F3 60 20 D9
0C09:FD AE 20 9E B7 8A A0 00 E2
0C11:99 00 04 99 00 05 99 00 57
0C19:06 99 00 07 C8 D0 F1 4C C4
0C21:A2 C3 EA EA EA 00 00 00 DE
```

Program 2: Notepad

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
FF 20 REM SCREENIUS DEMO (FIRS
      T LOAD AND RUN SCREENIUS
      )
KR 30 POKE53281,0:POKE53280,12
      :PRINT"{CLR}{5}
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
BR 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":FORI=1T
      01750:NEXT
MM 50 PRINT"{CLR}{DOWN}";:FORX
      =0TO3:SYS50045,X:NEXTX:R
      EM CLEAR ALL NOTEPAD SCR
      EENS
EX 60 PRINT"SCREENIUS NOTEPAD
      {SPACE}PROGRAM":PRINT
DF 70 REM THE FOLLOWING LINE D
      ISABLES SCREENIUS FUNCTI
      ON-KEY CHECKING
KE 80 POKE56333,127:POKE788,49
      :POKE789,234:POKE56333,1
      29
XX 90 PRINT"PRESS:":PRINT"
      {RVS}F1{OFF} FOR THIS ME
      NU":PRINT"{RVS}F3{OFF} F
      OR NOTEPAD 1"
PA 100 PRINT"{RVS}F5{OFF} FOR
       {SPACE}NOTEPAD 2":PRINT
       "{RVS}F7{OFF} FOR NOTEP
       AD 3"
DA 110 PRINT"{RVS}F2{OFF} TO S
       AVE NOTEPADS":PRINT"
       {RVS}F4{OFF} TO LOAD NO
       TEPADS"
FK 120 PRINT"{RVS}F6{OFF} TO D
       UMP CURRENT NOTEPAD TO
       {SPACE}A PRINTER"
DE 130 PRINT"{RVS}F8{OFF} TO E
       ND THE PROGRAM":PRINT
RB 140 SV=49648:REM SAVE ROUTI
       NE ADDRESS
CM 150 LD=49714:REM LOAD ROUTI
       NE ADDRESS
HP 160 PR=49882:REM PRINT ROUT
       INE ADDRESS
PH 170 DS=50032:REM DISPLAY SC
       REEN ROUTINE
PK 180 SR=50045:REM STORE SCRE
       EN ADDRESS
GG 190 PRINT"ALL NORMAL EDITIN
       G FEATURES ARE ACTIVE,"
XG 200 PRINT"INCLUDING COLOR C
       ONTROLS.":PRINT
EB 210 PRINT"DO NOT CLEAR THIS
        MENU SCREEN"
GS 220 PRINT"OR YOU WILL LOSE
       {SPACE}IT!"
SF 230 SN=0:A=209:B=210:C=211:
       SYSSR,0
HA 240 X=PEEK(A)+256*PEEK(B)+P
       EEK(C):POKEX,PEEK(X)OR1
       28
HQ 250 GETA$:IFA$=""THEN250
SH 260 CH=ASC(A$):IFCH<133ORCH
       >136THEN280
SM 270 POKEX,PEEK(X)AND127:SYS
       SR,SN:SN=CH-133:SYSDS,S
       N:GOTO240:REM UNSHIFTED
        F KEY
XB 280 IFA$=CHR$(137)THENGOSUB
       330:GOTO250
SM 290 IFA$=CHR$(138)THENGOSUB
       360:GOTO250
RQ 300 IFA$=CHR$(139)THENGOSUB
       390:GOTO250
SA 310 IFA$=CHR$(140)THENPRINT
       "{CLR}":END
DB 320 POKEX,PEEK(X)AND127:PRI
       NTA$;:GOTO240:
AG 330 SYSSR,SN:PRINT"{CLR}
       {DOWN}SAVE NOTEPADS:"
JM 340 INPUT"FILENAME";FI$
KP 350 SYSSV,FI$:SYSDS,SN:RETU
       RN
RD 360 SYSSR,SN:PRINT"{CLR}
       {DOWN}LOAD NOTEPADS:"
RE 370 INPUT"FILENAME";FI$
EE 380 SYSLD,FI$:SYSDS,SN:RETU
       RN
KS 390 POKEX,PEEK(X)AND127:SYS
       SR,SN:SYSPR,SN:POKEX,PE
       EK(X)OR128:RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

SpeedPrint

Article on page 60.

Program 1: SpeedPrint Loader

```
GF 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED.
RH 20 IFLL=1THEN100
PM 30 IFLL=2THEN420
KK 40 GOSUB540
EH 50 SS$="SPEEDSCRIPT 3.2":RE
      M SPEEDSCRIPT FILENAME T
      O BOOT
AS 60 FC$="{F}":REM FONT-CHANG
      E CODE
GM 70 TP$="{T}":REM TEMPORARY
      {SPACE}FONT-CHANGE CODE
AQ 80 RE$="{R}":REM RESTORE-FO
      NT CODE
QH 90 PRINT"{CLR}{WHT}{N}PLEAS
      E WAIT....":LL=1:LOAD"SP
      EEDPRINT.ML",8,1
HJ 100 POKEFC,ASC(FC$):POKETP,
       ASC(TP$):POKERE,ASC(RE$
       )
JF 110 GOSUB180:GOSUB250:IFFI$
       <>""ANDNF<11THEN110
BC 120 PRINT"{CLR}{WHT}
       {2 DOWN}BOOTING "SS$"..
       .."
EH 130 PRINT"{BLK}{2 DOWN}LOAD
       "QU$SS$QU$",8"
SJ 140 PRINT"{6 DOWN}SYS49152"
CF 150 PRINT"{2 DOWN}POKE2473,
       "FNH(MEM)+1:PRINT"
       {2 DOWN}RUN"
MH 160 FORI=631TO636:POKEI,13:
       NEXT:POKE198,8:POKE637,
       147:POKE638,89
HR 170 PRINT"{HOME}{2 DOWN}":E
       ND
PK 180 PRINT"{CLR}{2 DOWN}{N}
       {WHT}"TAB(10)"SPEEDPRIN
       T BOOTER"
AF 190 PRINTTAB(2)"{DOWN}{5}CO
       PYRIGHT 1988 COMPUTE! P
       UBL. INC."
BQ 200 PRINTTAB(9)"ALL RIGHTS
       {SPACE}RESERVED"
AD 210 PRINT"{DOWN}THESE FONT
       {SPACE}TYPES HAVE ALREA
       DY BEEN":PRINT"
       {2 SPACES}INSTALLED:
       {DOWN}"
HG 220 PRINT"CODE{3 SPACES}NAM
       E":PRINT"---- --------"
PR 230 FORI=1TONF:PRINT"{5} "A
       B$(I)"{2 SPACES}"FI$(I)
       :NEXT
MF 240 RETURN
SE 250 PRINT"{2 DOWN}{WHT}ENTE
       R NAME OF NEXT FONT OR
       {SPACE}<RETURN>":PRINT"
       {2 SPACES}FOR NO MORE F
       ONTS.{5}"
FQ 260 FI$="":INPUTFI$
RF 270 IFFI$=""THENRETURN
HC 280 IFLEFT$(FI$,4)="FONT"AN
       DMID$(FI$,7,1)="/"THEN3
       10
HF 290 INPUT"{WHT}ENTER 2-CHAR
       ACTER ABBREVIATION{5}";
       A$:IFLEN(A$)<>2THEN290
AA 300 FI$="FONT"+A$+"/"+FI$
BF 310 AB$=MID$(FI$,5,2):FORI=
       1TONF:IFAB$<>AB$(I)THEN
       NEXT:GOTO330
DH 320 PRINT"{2 DOWN}{WHT}CODE
        '"AB$"' ALREADY USED."
       :INPUT"PRESS <RETURN>";
       A$:RETURN
QM 330 PRINT"{2 DOWN}{WHT}LOAD
        FONT: "QU$FI$QU$"{5}";
       :INPUTA$
JP 340 IFA$="YES"ORA$="Y"ORA$=
       "Y"THEN360
PQ 350 RETURN
FA 360 LL=2:OPEN15,8,15
HE 370 POKEAA,1:POKEXX,8:POKEY
       Y,0:SYS(SLFS)
JC 380 FORI=1TOLEN(FI$):POKE52
       991+I,ASC(MID$(FI$,I,1)
       ):NEXT
BM 390 POKEAA,LEN(FI$):POKEXX,
       FNL(52992):POKEYY,FNH(5
       2992):SYS(SNAM)
PJ 400 PRINT"{WHT}{DOWN}LOADIN
       G...."
BM 410 POKEAA,0:POKEXX,FNL(MEM
       ):POKEYY,FNH(MEM):SYS(L
       OD)
AP 420 INPUT#15,A$,B$,C$,D$:IF
       VAL(A$)>19THEN500
FK 430 AB$=MID$(FI$,5,2):CLOSE
       15:T2=SETS+NF*6
AG 440 POKET2,ASC(AB$):POKET2+
       1,ASC(RIGHT$(AB$,1))
JP 450 POKET2+2,FNL(MEM+2):POK
       ET2+3,FNH(MEM+2)
SP 460 M=MEM+2+PEEK(MEM)+PEEK(
       MEM+1)*256:POKET2+4,FNL
       (M):POKET2+5,FNH(M)
DK 470 POKET2+6,0:POKET2+7,0
XR 480 MEM=PEEK(XX)+256*PEEK(Y
       Y)+1
```

```
HE 490 NF=NF+1:FI$(NF)=MID$(FI
       $,8):AB$(NF)=AB$:RETURN
EP 500 PRINT"{2 DOWN}{WHT}DISK
        ERROR:":PRINTA$" "B$"
       {SPACE}"C$" "D$
DM 510 INPUT"{DOWN}PRESS <RETU
       RN>";A$
EQ 520 CLOSE 15
JH 530 RETURN
GP 540 REM INITIALIZE
MD 550 POKE53280,6:POKE53281,0
       :CO$="{8}":PRINTCO$
SM 560 DIMFI$(10),AB$(10):QU$=
       CHR$(34)
GX 570 FI$(1)="BASIC":AB$(1)="
       BA":FI$(2)="DEFAULT":AB
       $(2)="DF":NF=2
MR 580 SETS=50302:FCCHAR=50299
       :TPCHAR=50300:REST=5030
       1
PC 590 MEM=11005
QM 600 DEFFNH(X)=INT(X/256):DE
       FFNL(X)=X-256*FNH(X)
XM 610 AA=780:XX=781:YY=782:SS
       =783
CX 620 SLFS=65466:SNAM=65469:L
       OD=65493
DR 630 RETURN
```

Program 2: SpeedPrint

See instructions in article on page 60 before typing in.

```
C000:A9 00 85 FB 85 FD A9 C0 FE
C008:85 FC A9 25 85 FE A9 BC 4B
C010:8D CF 29 A9 04 8D D0 29 2D
C018:20 D9 C3 4C 1E 25 A9 6C A2
C020:8D 26 03 A9 28 8D 27 03 B5
C028:A9 00 8D C0 29 8D C1 29 68
C030:8D BD 29 8D C2 29 60 8D EE
C038:D5 29 AD 77 29 85 FB AD 21
C040:78 29 85 FC AD 79 29 8D FB
C048:D3 29 AD 7A 29 8D D4 29 AD
C050:A2 00 A1 FB F0 22 CD D5 98
C058:29 F0 23 E6 FB D0 02 E6 8B
C060:FC A1 FB 18 6D D3 29 8D 64
C068:D3 29 90 03 EE D4 29 E6 64
C070:FB D0 DF E6 FC 4C 52 25 71
C078:AD D5 29 A2 01 60 AD D3 4E
C080:29 85 FB AD D4 29 85 FC A5
C088:AD D5 29 A2 00 60 A2 00 6C
C090:A1 FB C9 FF F0 03 A9 06 08
C098:2C A9 01 18 65 FB 85 FB 5E
C0A0:90 02 E6 FC 60 8E CC 29 97
C0A8:8C CD 29 A0 00 B1 FB C9 9B
C0B0:FF F0 12 B1 FB 09 80 0D DD
C0B8:C2 29 20 1B 26 C8 C0 06 77
C0C0:D0 F1 4C DC 25 AD C2 29 0D
C0C8:F0 0D A2 06 A9 84 20 1B 75
C0D0:26 CA D0 FA 4C DC 25 A9 AB
C0D8:20 20 2A 26 AC CD 29 AE B7
C0E0:CC 29 60 8E CC 29 20 8E E1
C0E8:25 4C A8 25 8E CC 29 20 91
C0F0:8E 25 20 8E 25 4C A8 25 C0
C0F8:AD BD 29 D0 0B 20 81 26 F4
C100:A9 08 8D BD 29 4C CA F1 E9
C108:60 AD BD 29 F0 FA A9 00 38
C110:8D BD 29 20 81 26 A9 0F F7
C118:4C CA F1 8D C8 29 8E C9 5D
C120:29 8C CA 29 20 F8 25 4C C2
C128:4D 26 8D C8 29 8E C9 29 5A
C130:8C CA 29 20 09 26 AD C8 D8
C138:29 C9 20 F0 10 20 81 26 FF
C140:AD C8 29 20 CA F1 AE C9 39
C148:29 AC CA 29 60 AE C9 29 F1
C150:AD C8 29 AC CA 29 AE C0 E5
C158:29 D0 09 EE C0 29 8D BE 39
C160:29 4C 77 26 CD BE 29 D0 69
C168:06 20 D9 26 4C 77 26 48 69
C170:20 81 26 68 4C 5B 26 AE 7A
C178:C9 29 AD C8 29 AC CA 29 28
C180:60 AD BE 29 C9 20 F0 07 C1
C188:AE C0 29 E0 03 B0 0F AD 6D
C190:BE 29 AE C0 29 CA 30 15 89
C198:20 CA F1 4C 95 26 A9 1A 94
C1A0:20 CA F1 8A 20 CA F1 AD 8B
C1A8:BE 29 20 CA F1 A9 00 8D 4A
C1B0:C0 29 60 AD BE 29 C9 20 14
C1B8:F0 07 C9 80 F0 03 20 81 0D
C1C0:26 A9 08 20 CA F1 A9 0D 43
C1C8:20 CA F1 A9 0F 20 CA F1 68
C1D0:A9 00 8D C0 29 8D BD 29 0B
C1D8:60 EE C0 29 D0 0F CE C0 14
C1E0:29 8A 48 20 81 26 68 AA C6
C1E8:A9 01 8D C0 29 60 A0 00 4B
C1F0:8C C0 29 8C C2 29 4C 18 44
C1F8:27 B9 FD 29 20 A6 27 F0 AB
C200:16 20 37 25 D0 06 20 A5 56
C208:25 4C 17 27 C9 08 D0 04 9C
C210:C8 4C 17 27 20 60 28 C8 FD
C218:CC C1 29 90 DC 60 A0 00 4C
C220:8C C0 29 4C 45 27 B9 FD 3E
C228:29 20 A6 27 F0 16 20 37 E8
C230:25 D0 06 20 E3 25 4C 44 CF
C238:27 C9 08 D0 04 C8 4C 44 F1
C240:27 20 2A 26 C8 CC C1 29 2F
C248:90 DC 60 A0 00 8C C0 29 40
C250:4C 93 27 B9 FD 29 20 A6 DC
C258:27 F0 37 20 37 25 D0 15 9B
C260:A9 00 8D C2 29 20 99 27 BC
C268:D0 05 A9 84 8D C2 29 20 FE
C270:EC 25 4C 92 27 C9 08 D0 A9
C278:04 C8 4C 92 27 20 99 27 F8
C280:D0 0D A9 84 A2 06 20 1B B7
C288:26 CA D0 FA 4C 92 27 20 B8
C290:60 28 C8 CC C1 29 90 BB C5
C298:60 B9 FE 29 C9 08 D0 05 44
C2A0:B9 FF 29 C9 5F 60 B9 FD B2
C2A8:29 CD 7B 29 F0 31 CD 7C 9C
C2B0:29 D0 11 EE D8 29 AD D8 AF
C2B8:29 29 07 8D D8 29 20 34 B6
C2C0:28 4C DF 27 CD 7D 29 D0 63
C2C8:62 AD D8 29 29 07 20 4A 88
C2D0:28 CE D8 29 AD D8 29 29 18
C2D8:07 8D D8 29 A9 00 60 20 21
C2E0:99 27 D0 02 C8 C8 B9 FE 13
C2E8:29 8D D6 29 C8 20 99 27 F4
C2F0:D0 02 C8 C8 B9 FE 29 8D AE
C2F8:D7 29 C8 A2 00 BD 7E 29 15
C300:1D 7F 29 F0 24 BD 7E 29 68
C308:CD D6 29 D0 1F BD 7F 29 76
C310:CD D7 29 D0 17 8C CE 29 58
C318:A0 00 BD 80 29 99 77 29 77
C320:E8 C8 C0 04 D0 F4 AC CE 29
C328:29 A9 00 60 8A 18 69 06 42
C330:AA 4C FD 27 8C BF 29 0A 12
C338:0A A8 A2 FC BD 7B 28 99 D8
C340:D9 29 C8 E8 D0 F6 AC BF 22
C348:29 60 8C BF 29 0A 0A A8 38
C350:A2 FC B9 D9 29 9D 7B 28 1C
C358:C8 E8 D0 F6 AC BF 29 60 1F
C360:8D C6 29 A9 20 20 2A 26 1C
C368:AD C6 29 60 48 A5 9A C9 7B
C370:04 F0 07 C9 05 F0 03 4C F1
C378:CD F1 68 8D C3 29 8E C4 ED
C380:29 8C C5 29 AE C1 29 9D 77
C388:FD 29 C9 0D F0 0E EE C1 C2
C390:29 AD C3 29 AE C4 29 AC AA
C398:C5 29 18 60 A5 FB 8D D1 60
C3A0:29 A5 FC 8D D2 29 A9 08 35
C3A8:20 34 28 20 EE 26 20 B3 58
C3B0:26 A9 08 20 4A 28 20 1E 0A
C3B8:27 20 B3 26 A9 08 20 4A AC
C3C0:28 20 4B 27 20 B3 26 AD 0A
C3C8:D1 29 85 FB AD D2 29 85 84
C3D0:FC A9 00 8D C1 29 4C 91 F6
C3D8:28 AD D0 29 F0 12 A0 00 9D
C3E0:B1 FB 91 FD C8 D0 F9 E6 B6
C3E8:FC E6 FE CE D0 29 D0 F0 33
C3F0:AE CF 29 F0 0A A0 00 B1 7C
C3F8:FB 91 FD C8 CA D0 F8 60 1B
C400:4A 0D 47 0D 50 0D 51 0D 12
C408:59 0D 2C 0D 3B 0D 22 08 32
C410:00 FF 00 00 04 7D 00 00 AF
C418:04 08 08 07 00 00 FF 38 4F
C420:44 44 44 7C 00 04 08 08 55
C428:08 07 00 FF 7C 44 44 44 39
C430:38 00 0F 00 00 00 00 00 B7
C438:FF 38 44 44 44 7C 00 00 B0
C440:00 00 00 0F 00 FF 3C 40 73
C448:40 40 7C 00 04 08 08 08 E9
C450:07 00 FF 00 20 60 00 00 DF
C458:00 00 02 01 00 00 00 FF 32
C460:00 24 64 00 00 00 00 02 81
C468:01 00 00 00 FF 00 07 00 80
C470:07 00 00 FF 22 08 00 00 AE
C478:29 11 29 BB A3 B2 42 41 69
C480:74 29 6C 29 44 46 00 29 13
C488:11 29 00 00 00 00 00 00 E4
```

Program 3: Font Editor

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
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AQ 20 PRINT"{CLR}{3 DOWN}{N}PL
      EASE WAIT...":GOSUB2220:
      GOTO820
MS 30 PRINT"{CLR}":GOSUB2220:G
      OTO820
HC 40 REM DRAW SCREEN
FD 50 REM{3 SPACES}GIVEN C=CHA
      R #, CH=ADDR OF CHAR
QM 60 GOSUB260:IFFL%(C)THENGOS
      UB210:GOSUB320:GOTO80
ER 70 GOSUB240:GOSUB290
PQ 80 REM ENTRY W/O GRID
PR 90 PRINTVT$(16)TAB(14)"{N}
      {H}{5}<--U"
RP 100 PRINT"{HOME}"TAB(16)"
       {WHT}SPEEDPRINT FONT ED
       ITOR"
EQ 110 PRINTTAB(20)"{5}COPYRIG
       HT 1988":PRINTTAB(16)"C
       OMPUTE! PUBLICATIONS"
DQ 120 PRINTTAB(17)"ALL RIGHTS
        RESERVED{DOWN}"
EB 130 PRINTVT$(8)T$"{8}---
       {2 SPACES}COMMANDS
       {2 SPACES}---":PRINTT$"
       {WHT}<CURSOR KEYS>"
FS 140 PRINTT$"<RETURN><HOME><
       CLR>":PRINTT$"<SPC>{5}
       {2 SPACES}TOGGLE PIXEL"
FF 150 PRINTT$"{WHT}+{5} NEXT
       {SPACE}CHAR":PRINTT$"
       {WHT}-{5} PREV CHAR"
BS 160 PRINTT$"{WHT}SHFT +{5}
       {SPACE}NEXT ENTRY":PRIN
       TT$"{WHT}SHFT -{5} PREV
        ENTRY"
CS 170 PRINTT$"{WHT}P{5}RINT C
       URRENT CHAR":PRINTT$"
       {WHT}SHFT P{5} PRINT ST
       RING"
XG 180 PRINTT$"{WHT}G{5}OTO
       {5 SPACES}{WHT}C{5}OPY"
       :PRINTT$"{WHT}L{5}OAD
       {5 SPACES}{WHT}S{5}AVE"
AR 190 PRINTT$"{WHT}I{5}NCLUDE
       {2 SPACES}{WHT}E{5}XCLU
       DE":PRINTT$"{WHT}A{5}SC
       II{4 SPACES}{WHT}Q{5}UI
       T"
MC 200 RETURN
QQ 210 REM DRAW GRID
FP 220 PRINTCO$(0)"{HOME}
       {DOWN}"BO$
KP 230 FORI=0TO2:PRINTCO$(I);:
       FORJ=1TO7:PRINTLI$:NEXT
       :NEXT:PRINTBO$:RETURN
AR 240 REM ERASE GRID
DF 250 PRINT"{HOME}{DOWN}";:FO
       RI=1TO23:PRINT"
       {14 SPACES}":NEXT:RETUR
       N
BD 260 REM UPDATE CHAR DISPLAY
GJ 270 PRINTVT$(3)TAB(15)"
       {WHT}CHAR: "QU$CHR$(C)Q
       U$
```

```
EF 280 PRINTVT$(3)TAB(25)"= CH
       R$("C"{LEFT} ) ":RETURN
HQ 290 REM NOT ALTERED MESSAGE
BJ 300 PRINTVT$(9)"{8}
       {2 SPACES}*CHARACTER *"
       :PRINT"{2 SPACES}*
       {2 SPACES}NOT IN
       {2 SPACES}*":PRINT"
       {2 SPACES}*ALTERATION*"
CC 310 PRINT"{2 SPACES}*
       {3 SPACES}LIST
       {3 SPACES}*":RETURN
AR 320 REM MEM TO GRID
EG 330 REM{3 SPACES}GIVEN CH=A
       DDR OF CHAR
KM 340 AD=CH:Y=0
SE 350 GOSUB420
BK 360 FORY=0TO14STEP7
HG 370 FORX=0TO5:BY=PEEK(AD+X)
       :IFBY=0THEN400
JK 380 BI=1:FORYY=0TO6:IFBIAND
       BYTHENPRINTVT$(Y+YY)TAB
       (FNHT(X))CO$(Y/7)"{RVS}
        {OFF}"
CR 390 BI=BI*2:NEXTYY
BQ 400 NEXTX:AD=AD+6:NEXTY
PE 410 GOSUB440:RETURN
QG 420 REM WAIT
XK 430 POKESO,0:PRINTVT$(9)"
       {WHT}******":PRINT" WAI
       T ":PRINT"******":RETUR
       N
AX 440 REM END WAIT
EJ 450 PRINTVT$(9)"{6 SPACES}"
       :PRINT"{6 SPACES}":PRIN
       T"{6 SPACES}":RETURN
JM 460 REM TOGGLE PIXEL
GE 470 REM{3 SPACES}GIVEN SET=
       0/1: CLR/SET, X,Y=CO-OR
       DS, CH=ADDR OF CHAR
AD 480 BY=CH+INT(Y/7)*6+X:BI=2
       ↑(Y-INT(Y/7)*7):SET=1+(
       (PEEK(BY)ANDBI)>0)
MF 490 PRINTVT$(Y)TAB(FNHT(X))
       CO$(Y/7)SET$(SET);
ED 500 POKEBY,(PEEK(BY)AND255-
       BI)ORBI*SET
AF 510 RETURN
PC 520 REM PRINT STRING
HH 530 REM{3 SPACES}GIVEN MS$=
       STRING
PP 540 OPEN1,4,7:FORI=0TO2
PB 550 FORI=0TO2:FORJ=0TO1:MO=
       -(I=2ANDJ=1):PRINT#1,PB
       $;:FORK=1TOLEN(MS$)
BB 560 A=ASC(MID$(MS$,K,1)):M=
       ME+A*18:IFFL%(A)THEN600
QX 570 IFI<>1ANDMO=0THENPRINT#
       1,TX$" ";:GOTO610
MA 580 IFI=1THENPRINT#1,TX$CHR
       $(A);:GOTO610
GX 590 PRINT#1,HR$CHR$(26)CHR$
       (6)CHR$(132);:GOTO610
GD 600 PRINT#1,HR$;:FORL=0TO5:
       PRINT#1,CHR$(PEEK(M+I*6
       +L)OR128OR4*MO);:NEXT
HP 610 NEXT:NEXT:PRINT#1,HR$CR
       $TX$;:NEXT:CLOSE1:RETUR
       N
GA 620 REM INQUIRE
PP 630 REM{3 SPACES}GIVEN MS$=
       MESSAGE
RB 640 POKESO,0:FORI=1TO10:GET
       A$:NEXT:IFM2$=""THENMS$
       =MS$+" (Y/N)?":GOTO660
GS 650 M2$=M2$+" (Y/N)?"
JK 660 PRINT"{WHT}{RVS}"VT$(5)
       TAB(15)MS$:PRINT"{RVS}"
       TAB(15)M2$
RB 670 GETA$:IFA$<>"Y"ANDA$<>"
       N"THEN670
CM 680 PRINTTAB(15)"{2 UP}"BL$
       "{2 RIGHT}"TAB(15)BL$:M
       2$="":RETURN
KH 690 REM MESSAGE
FC 700 REM{3 SPACES}GIVEN MS$,
       M2$=MESSAGE
KX 710 POKESO,0:PRINT"{WHT}"VT
       $(5)TAB(15)MS$:PRINTTAB
       (15)M2$
KE 720 FORI=1TO2500:NEXT:M2$="
       ":PRINT"{2 UP}"TAB(15)B
       L$"{2 RIGHT}"TAB(15)BL$
       :RETURN
QG 730 REM SET CURSOR
FB 740 POKEVIC,CX*8+72:POKEVIC
       +1,CY*8+59:POKESO,1
MM 750 REM GET COMMAND
PD 760 POKESO,1:POKESC,PEEK(SC
       )-1:GETA$:IFA$=""THEN76
       0
JK 770 IFA$=CR$THEN960
HX 780 FORI=1TO21:IFA$<>MID$("
       {UP}{DOWN}{LEFT}{RIGHT}
        +-+-GIEPQ{CLR}{HOME}CL
       SPA",I,1)THENNEXT:GOTO7
       60
JB 790 ON I GOTO840,870,900,93
       0,980,1000,1050,1100,11
       50,1200
JE 800 ON I-10 GOTO1240,1270,1
       290,1340,1370,1400,1420
       ,1490,1740,2130
HK 810 ON I-20GOTO2180
XM 820 REM CLR AND CONT
AC 830 PRINT"{CLR}":GOSUB40:GO
       TO730
HP 840 REM UP
PD 850 CY=CY-1:IFCY<0THENCY=20
PM 860 GOTO730
KG 870 REM DOWN
AG 880 CY=CY+1:IFCY>20THENCY=0
XQ 890 GOTO730
FA 900 REM LEFT
PJ 910 CX=CX-1:IFCX<0THENCX=5
AS 920 GOTO730
HM 930 REM RIGHT
FJ 940 CX=CX+1:IFCX>5THENCX=0
FA 950 GOTO730
FC 960 REM RETURN
DQ 970 CX=0:GOTO870
XB 980 REM TOGGLE
MJ 990 X=CX:Y=CY:GOSUB460:GOTO
       750
JH 1000 REM +
ER 1010 GOSUB240
GS 1020 C=C+1:IFC>255THENC=32
ED 1030 GOSUB260:CH=ME+C*18:GE
       TA$:IFA$="+"THEN1020
HD 1040 GOSUB40:GOTO750
KQ 1050 REM -
EB 1060 GOSUB240
XR 1070 C=C-1:IFC<32THENC=255
GQ 1080 GOSUB260:CH=ME+C*18:GE
       TA$:IFA$="-"THEN1070
AH 1090 GOSUB40:GOTO750
GS 1100 REM SHFT +
CP 1110 J=C:GOSUB240:GOSUB420
KE 1120 C=C+1:IFC>255THENC=32
DE 1130 IFFL%(C)=0ANDC<>JTHEN1
       120
PM 1140 CH=ME+C*18:GOSUB40:GOT
       O750
SE 1150 REM SHFT -
SH 1160 J=C:GOSUB240:GOSUB420
BM 1170 C=C-1:IFC<32THENC=255
GK 1180 IFFL%(C)=0ANDC<>JTHEN1
       170
CR 1190 GOTO1140
DJ 1200 REM GOTO
RC 1210 POKESO,0:INPUT"{CLR}
       {WHT}{3 DOWN}GOTO WHIC
       H ASCII CODE";A
KS 1220 IFA>31ANDA<256THENC=A:
       CH=ME+18*C
RM 1230 GOTO820
JB 1240 REM INCLUDE
MA 1250 FL%(C)=1
RR 1260 GOSUB40:GOTO750
KP 1270 REM EXCLUDE
EE 1280 FL%(C)=0:GOTO1260
DR 1290 REM P
EG 1300 IFFL%(C)=0THEN750
RG 1310 MS$="PRINT THIS CHAR":
       GOSUB620
BG 1320 IFA$="Y"THENMS$=" "+CH
       R$(C)+" ":GOSUB520
BC 1330 GOTO750
FG 1340 REM QUIT
EQ 1350 MS$="QUIT PROGRAM":GOS
       UB620:IFA$="Y"THENPRIN
       T"{CLR}{8}{TAB}BYE.":P
       OKESO,0:END
SE 1360 GOTO750
FP 1370 REM CLR
FX 1380 MS$="CLEAR CHAR":GOSUB
       620:IFA$="N"THEN750
BA 1390 FORI=CHTOCH+17:POKEI,0
       :NEXT:GOSUB40:GOTO750
DM 1400 REM HOME
JB 1410 CX=0:CY=0:GOTO730
JP 1420 REM COPY
KG 1430 POKESO,0:PRINT"{CLR}
       {3 DOWN}COPY THIS CHAR
       ACTER TO WHICH ASCII":
       A=0
JJ 1440 INPUT"{2 SPACES}CHARAC
       TER";A:IFA>255ORA<32OR
       A=CTHEN820
AP 1450 OC=C:C=A:C2=CH:CH=ME+1
       8*C:PRINT"{CLR}":GOSUB
       40
FA 1460 MS$="REPLACE WITH"+STR
       $(OC):GOSUB620
FJ 1470 IFA$="N"THENC=OC:CH=C2
       :MS$="** CANCELLED **"
       :GOSUB690:GOTO820
RE 1480 FORI=0TO17:POKECH+I,PE
       EK(C2+I):NEXT:GOSUB40:
       GOTO750
BR 1490 REM LOAD
QA 1500 MS$="LOAD":GOSUB1630:I
       FFL=1THEN820
XH 1510 F2%=0:OPEN15,8,15:OPEN
       1,8,3,FI$:GOSUB2040:IF
       FLTHEN820
QX 1520 GOSUB240:GOSUB420:GOSU
       B2430:GET#1,A$,A$,A$,A
       $:S=0
SM 1530 GET#1,A$:IFA$=""THEN15
       50
PX 1540 S=S+1:O%(S)=ASC(A$+C0$
       ):GET#1,A$:GOTO1530
PC 1550 IFS=0THEN65535
GH 1560 FORI=1TOS
AA 1570 PRINTW$;W$(IAND3);:CC=
       O%(I):FL%(CC)=1:M=ME+C
       C*18:FORJ=0TO2:GET#1,A
       $
FR 1580 IFA$=CHR$(255)THENFORK
       =0TO5:POKEM+K,0:NEXT:G
       OTO1600
HS 1590 POKEM,ASC(A$+C0$):FORK
       =1TO5:GET#1,A$:POKEM+K
       ,ASC(A$+C0$):NEXT
RK 1600 M=M+6:NEXT:NEXT
BJ 1610 GOSUB80:GOSUB2040:IFFL
       =0THENCLOSE1:CLOSE15:M
       S$="FINISHED.":GOSUB69
       0
HX 1620 C=32:GOTO1100
MM 1630 REM FILENAME
GE 1640 REM{3 SPACES}GIVEN MS$
       =MESSAGE
DG 1650 REM{3 SPACES}RETURNS F
       I$=FILENAME, FL=1 IF E
       RROR
```

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Flight Sim Scenery 5	14.16
Flight Sim Scenery 6	14.16
Flight Sim Scenery 7	17.46
Flight Sim Scenery 11	17.46
Flight Sim Scenery 14	17.46
Flight Sim Scenery Japan	17.46
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Introducing the 1541 RAMBOard

Copy protection's "worst nightmare"

The dream has been there for years now: an inexpensive piece of hardware that, when added to your system, would allow you to backup almost every single piece of software ever released for the C64.

Software Support has just made the dream a reality!

We're proud to introduce the 1541 RAMBOard, a small card that can easily be installed into your 1541/1541C disk drive in 5 minutes using just a screwdriver. With this powerful card in place, backup hassles are a thing of the past! Working with special software, the RAMBOard will backup software that other utilities can't even scratch the surface of. And as new protection schemes arrive, we'll create new parameters to keep your RAMBOard operating behind enemy lines.

RAMBOard also comes bundled with a fast copier that can archive an unprotected data disk in under 50 seconds!

The concepts behind "card" systems are public domain. So why should you have to pay $44.95 or more for someone else's "card"? Software Support will sell you the hardware* for just $26.95!!! So if you don't have an unlimited income, don't worry. Just order your new RAMBOard from Software Support -- the company that's declared war on high prices.

RAMBOard -- Our Price: $26.95

Other companies "card" boards: $44.95 or more.

*The 1541 RAMBOard requires software to operate. This software can be either RAMBOard parameters, soon to be found on our Renegade program disk, or any of the other "card" software already on the market.

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```
HP 1660 PRINT"{CLR}{3 DOWN}"MS
        $":":FL=0:FI$="":INPUT
        "FILENAME";FI$
KE 1670 IFLEFT$(FI$,4)="FONT"A
        NDMID$(FI$,7,1)="/"THE
        N1700
SH 1680 INPUT"2-CHARACTER ABBR
        EVIATION";A$:IFLEN(A$)
        <>2THEN1680
BE 1690 FI$="FONT"+A$+"/"+FI$
MP 1700 PRINT"{CLR}":GOSUB80
JR 1710 IFLEN(FI$)>15THENMS$="
        {RVS}FILENAME TOO LONG
        .":GOSUB690:FL=1:RETUR
        N
SR 1720 MS$=MS$+" WITH NAME:":
        M2$=QU$+FI$+QU$:GOSUB6
        20:IFA$="N"THENFL=1
CQ 1730 RETURN
HF 1740 REM SAVE
EF 1750 MS$="SAVE":GOSUB1630:I
        FFL=1THEN820
DR 1760 OPEN15,8,15
HF 1770 OPEN1,8,3,FI$+",W,P":I
        NPUT#15,A$,B$,C$,D$:A=
        VAL(A$)
PR 1780 IFA<>63THEN1810
SQ 1790 CLOSE1:MS$="REPLACE FI
        LE":GOSUB620:IFA$="N"T
        HENCLOSE15:GOTO820
DH 1800 PRINT#15,"S0:"+FI$:GOT
        O1770
HD 1810 IFA>19THENGOSUB2060:GO
        TO820
JX 1820 PRINT#1,CHR$(0)CHR$(19
        2);:GOSUB420:F2%=-(FL%
        (34)=0):IFF2%=0THEN185
        0
SA 1830 M=ME+34*18:FORI=MTOM+1
        7:POKEI,0:NEXT:POKEM+7
        ,7:POKEM+9,7
SR 1840 FL%(34)=1:REM MAKE SUR
        E QUOTE DEFINED
GE 1850 S=0:FORI=32TO255:S=S+F
        L%(I):NEXT:S=1+2*S
HX 1860 PRINT#1,CHR$(SAND255)C
        HR$(S/256);
GX 1870 CC=32:I=0
XX 1880 IFFL%(CC)=0THEN1930
XJ 1890 II=II+1:PRINTW$;W$(IIA
        ND3);
CS 1900 S%=3:M=ME+CC*18:FORI=0
        TO12STEP6:S=0:FORJ=0TO
        5:S=S+PEEK(M+I+J):NEXT
FD 1910 L%=-(S>0):S%=S%-5*(L%>
        0):L%(CC,I/6)=L%:NEXT
XQ 1920 PRINT#1,CHR$(CC)CHR$(S
        %);
DS 1930 CC=CC+1:IFCC<256THEN18
        80
KA 1940 PRINT#1,CHR$(0);:CC=32
PE 1950 IFFL%(CC)=0THEN2000
SQ 1960 II=II+1:PRINTW$;W$(IIA
        ND3);
FS 1970 M=ME+CC*18:FORI=0TO2:I
        FL%(CC,I)=0THENPRINT#1
        ,CHR$(255);:GOTO1990
MC 1980 FORJ=0TO5:PRINT#1,CHR$
        (PEEK(M+J));:NEXT
CC 1990 M=M+6:NEXT
JS 2000 CC=CC+1:IFCC<256THEN19
        50
BE 2010 CLOSE1:GOSUB440:GOSUB2
        040:IFFL=0THENMS$="FIN
        ISHED.":GOSUB690
RH 2020 IFF2%THENFL%(34)=0
PM 2030 CLOSE15:GOTO820
AG 2040 REM READ ERROR
DC 2050 INPUT#15,A$,B$,C$,D$:A
        =VAL(A$)
HG 2060 REM ENTRY IF ALREADY R
        EAD
GK 2070 IFA<20THENFL=0:RETURN
HG 2080 PRINT"{CLR}{2 DOWN}
        {WHT}{RVS}DISK ERROR:
        {DOWN}":PRINTA$" "B$"
        {SPACE}"C$" "D$" ":FL=
        1:CLOSE1:CLOSE15
DP 2090 PRINT"{DOWN}PRESS ANY
        {SPACE}KEY TO CONTINUE
        ....":FORI=1TO10:GETA$
        :NEXT
GR 2100 GETA$:IFA$=""THEN2100
GR 2110 IFF2%THENFL%(34)=0
EF 2120 RETURN
ER 2130 REM SHFT P
HC 2140 MS$="":POKE198,1:POKE6
        31,34:PRINT"{CLR}{WHT}
        {3 DOWN}PRINT WHAT?"
JS 2150 INPUTMS$:IFMS$=""THEN8
        20
BH 2160 PRINT"{CLR}":GOSUB80:I
        FLEN(MS$)>30THENMS$="
        {RVS}TOO LONG.":GOSUB6
        90:GOTO820
AB 2170 GOSUB240:GOSUB420:GOSU
        B520:GOTO820
SS 2180 REM ASCII
QP 2190 PRINTVT$(5)TAB(15)"
        {WHT}{RVS}INPUT KEY"
GF 2200 GETA$:IFA$=""THEN2200
AC 2210 MS$="ASCII ="+STR$(ASC
        (A$)):GOSUB690:GOTO750
AX 2220 REM INITIALIZE
JE 2230 LI$="{6 SPACES}{+}++++
        ++{+}":BO$="{6 SPACES}
        {8 +}"
CJ 2240 CO$(0)="{4}":CO$(1)="
        {WHT}":CO$(2)="{4}"
CC 2250 POKE53280,6:POKE53281,
        0:CO$="{8}":PRINTCO$
JA 2260 DIMVT$(20):VT$(0)="
        {HOME}{2 DOWN}":DEFFNH
        T(X)=7+X
QS 2270 FORI=1TO20:VT$(I)=VT$(
        I-1)+"{DOWN}":NEXT
HM 2280 SET$(0)="+":SET$(1)="
        {RVS} {OFF}":C0$=CHR$(
        0)
FR 2290 CR$=CHR$(13):HR$=CHR$(
        8):TX$=CHR$(15):PB$=TX
        $+"{7 SPACES}":QU$=CHR
        $(34)
PG 2300 VIC=53248:POKEVIC+16,0
        :POKEVIC+27,0:POKEVIC+
        23,0:POKEVIC+28,0
CE 2310 POKEVIC+29,0:SO=VIC+21
        :SC=VIC+39
JG 2320 POKE2040,11:FORI=704TO
        767:READA:POKEI,A:NEXT
PM 2330 DATA 0,0,0,0,0,0,0,0,24,
        0,0,24,0,0,24,0,0,24,0
        ,0,24,0
EM 2340 DATA 0,24,0,0,24,0,0,2
        4,0,63,255,252,0,24,0,
        0,24,0,0,24,0
PQ 2350 DATA 0,24,0,0,24,0,0,2
        4,0,0,24,0,0,24,0,0,0,
        0,0,0,0,0
FA 2360 POKE650,128:REM REPEAT
         KEYS
ER 2370 ME=49152-32*18:REM <SP
        ACE> STARTS AT $C000
CD 2380 BL$="{24 SPACES}":T$="
        {20 RIGHT}"
BB 2390 W$(0)="{C}":W$(1)="{V}
        ":W$(2)="{F}":W$(3)="
        {D}":W$="{HOME}
        {3 RIGHT}{5 DOWN}"
KF 2400 DIM FL%(255),L%(255,2)
        ,O%(255)
KQ 2410 GOSUB2430
HG 2420 RETURN
HK 2430 REM INIT FONT
KC 2440 X=0:Y=0:C=32:CH=ME+18*
        C:FORI=0TO255:FL%(I)=0
        :NEXT
QP 2450 RETURN
```

Program 4: Standard Font

See instructions in article on page 60 before typing in.

```
C000:3B 00 22 08 2C 0D 3B 0D FC
C008:47 0D 4A 0D 50 0D 51 0D F0
C010:59 0D 5C 0D 80 0D 81 0D 26
C018:82 0D 83 0D 84 0D 85 0D CF
C020:86 0D 87 0D 88 0D 89 0D 82
C028:8E 08 A6 0D AF 0D B0 08 B3
C030:B8 08 B9 08 BE 0D BF 0D 7E
C038:C0 0D DB 0D 00 FF 00 07 B0
C040:00 07 00 00 FF FF 00 20 A3
C048:60 00 00 00 00 02 01 00 04
C050:00 00 FF 00 24 64 00 00 84
C058:00 00 02 01 00 00 00 FF 2A
C060:38 44 44 44 7C 00 04 08 CF
C068:08 08 07 00 FF 00 00 04 D4
C070:7D 00 00 04 08 08 07 00 5F
C078:00 FF 7C 44 44 44 38 00 71
C080:0F 00 00 00 00 00 FF 38 C1
C088:44 44 44 7C 00 00 00 00 8D
C090:00 0F 00 FF 3C 40 40 40 79
C098:7C 00 04 08 08 08 07 00 C7
C0A0:00 00 40 40 00 00 40 3F ED
C0A8:44 44 3B 00 FF 70 08 48 DE
C0B0:28 70 00 03 05 04 04 03 D5
C0B8:00 FF 00 10 78 00 00 00 FE
C0C0:00 04 07 04 00 00 FF 10 74
C0C8:08 08 48 30 00 06 05 05 83
C0D0:04 04 00 FF 10 08 48 48 CE
C0D8:30 00 02 04 04 04 03 00 29
C0E0:FF 40 20 10 78 00 00 01 3C
C0E8:01 01 07 01 00 FF 38 28 B4
C0F0:28 28 68 00 02 04 04 04 C9
C0F8:03 00 FF 60 50 48 48 48 7E
C100:00 03 04 04 04 03 00 FF 31
C108:08 08 48 28 18 00 00 07 E4
C110:00 00 00 00 FF 30 48 48 2D
C118:48 30 00 03 04 04 04 03 37
C120:00 FF 30 48 48 48 70 00 72
C128:04 04 04 02 01 00 FF FF 57
C130:00 00 70 00 70 00 FF 00 45
C138:60 00 00 60 00 01 0F 01 15
C140:01 0F 01 FF 00 20 00 20 C8
C148:00 00 3E 41 41 41 3E 00 33
C150:FF FF 20 55 54 3D 40 00 45
C158:FF FF 3D 40 40 3D 40 00 FE
C160:FF FF 38 45 44 45 38 00 E6
C168:FF 00 20 00 20 00 00 3F 30
C170:40 40 40 3F 00 FF 00 20 40
C178:00 20 00 00 7E 09 09 09 37
C180:7E 00 FF 20 40 60 40 20 69
C188:00 05 03 07 03 05 00 FF 4A
C190:00 60 00 00 00 00 01 0F 3D
C198:01 00 00 00 FF 00 00 00 9C
```

Program 5: Italic Font

See instructions in article on page 60 before typing in.

```
C000:B7 00 21 08 22 08 28 08 8B
C008:29 08 2C 0D 30 08 31 08 82
C010:32 08 33 08 34 08 35 08 C7
C018:36 08 37 08 38 08 39 08 7A
C020:3B 0D 41 08 42 08 43 08 EB
C028:44 08 45 08 46 08 47 0D E4
C030:48 08 49 08 4A 0D 4B 08 A6
C038:4C 08 4D 08 4E 08 4F 08 45
C040:50 0D 51 0D 52 08 53 08 89
C048:54 08 55 08 56 08 57 08 AA
C050:58 08 59 0D 5A 08 5B 08 AD
C058:5C 0D 5D 08 80 0D 81 0D BF
C060:82 0D 83 0D 84 0D 85 0D 18
C068:86 0D 87 0D 88 0D 89 0D CA
```

```
C070:8E 08 A6 0D AF 0D B0 08 FB
C078:B8 08 B9 08 BE 0D BF 0D C6
C080:C0 0D C1 08 C2 08 C3 08 24
C088:C4 08 C5 08 C6 08 C7 08 95
C090:C8 08 C9 08 CA 08 CB 08 48
C098:CC 08 CD 08 CE 08 CF 08 FA
C0A0:D0 08 D1 08 D2 08 D3 08 AD
C0A8:D4 08 D5 08 D6 08 D7 08 60
C0B0:D8 08 D9 08 DA 08 DB 0D 18
C0B8:00 FF 00 40 18 07 00 00 1B
C0C0:FF FF 00 07 00 07 00 00 CE
C0C8:FF FF 00 00 3C 42 01 00 37
C0D0:FF FF 00 40 21 1E 00 00 D7
C0D8:FF FF 00 20 60 00 00 00 5F
C0E0:00 02 01 00 00 00 FF 38 3B
C0E8:56 49 49 3D 06 FF FF 00 15
C0F0:40 60 5A 07 00 FF FF 60 C6
C0F8:52 51 49 49 06 FF FF 20 06
C100:42 49 49 39 06 FF FF 00 E3
C108:18 14 72 19 17 FF FF 20 55
C110:46 45 45 25 19 FF FF 20 EB
C118:5C 4A 49 29 11 FF FF 00 A0
C120:71 09 05 05 03 FF FF 20 C7
C128:56 49 49 29 16 FF FF 44 D9
C130:4A 49 29 1D 02 FF FF 00 32
C138:24 64 00 00 00 00 02 01 EB
C140:00 00 00 FF 20 50 54 34 E2
C148:4C 00 FF FF 60 5E 49 44 45
C150:24 18 FF FF 20 58 44 44 1B
C158:44 04 FF FF 20 58 44 44 2E
C160:68 1F FF FF 20 58 54 54 3F
C168:14 08 FF FF 00 68 1E 09 DE
C170:01 02 FF FF 20 58 44 44 24
C178:64 1C 04 08 08 04 03 00 8C
C180:FF 60 1E 09 04 64 18 FF 52
C188:FF 40 60 5C 05 00 00 FF 16
C190:FF 00 00 00 00 74 0D 04 04
C198:08 08 06 01 00 FF 60 1E D1
C1A0:29 44 44 00 FF FF 00 00 52
C1A8:60 59 07 00 FF FF 60 1C 70
C1B0:04 18 64 18 FF FF 00 64 AE
C1B8:18 04 64 18 FF FF 20 58 EF
C1C0:44 44 24 18 FF FF 00 70 ED
C1C8:4C 44 24 18 0C 03 00 00 F5
C1D0:00 00 FF 00 70 48 44 64 E5
C1D8:1C 00 00 00 0E 01 00 FF DE
C1E0:60 1C 08 04 04 08 FF FF 1D
C1E8:40 48 54 54 34 04 FF FF 20
C1F0:00 24 5C 47 24 00 FF FF 9E
C1F8:30 48 44 20 58 04 FF FF 04
C200:00 38 44 20 10 0C FF FF CE
C208:20 58 24 50 20 1C FF FF AE
C210:40 24 18 30 48 04 FF FF 17
C218:20 58 44 40 60 1C 04 08 D3
C220:08 06 01 00 FF 40 60 54 61
C228:54 4C 04 FF FF 00 60 58 84
C230:47 01 01 FF 00 00 00 40 F9
C238:40 00 40 30 4E 45 24 1B D3
C240:FF FF 00 40 40 61 19 07 8A
C248:FF 40 30 48 48 68 30 03 AF
C250:05 04 04 03 00 FF 00 00 0A
C258:00 50 38 00 00 04 06 05 1A
C260:00 00 FF 00 10 08 48 48 5F
C268:30 06 05 05 04 04 00 FF A8
C270:00 10 48 48 48 30 02 04 92
C278:04 04 03 00 FF 00 40 20 02
C280:10 48 38 00 01 01 07 01 42
C288:01 FF 00 30 28 28 28 48 0C
C290:02 04 04 04 02 01 FF 00 EC
C298:60 50 48 48 08 02 05 04 46
C2A0:04 02 01 FF 00 08 48 28 A1
C2A8:28 18 00 07 00 00 00 00 B8
C2B0:FF 00 30 48 48 48 30 02 86
C2B8:05 04 04 02 01 FF 20 50 FA
C2C0:48 48 68 10 04 04 04 02 C4
C2C8:01 00 FF FF 00 00 70 00 AF
C2D0:70 00 FF 00 60 00 00 60 F1
C2D8:00 01 0F 01 01 0F 01 FF D6
C2E0:00 00 20 00 00 20 20 5C 87
C2E8:42 41 21 1E FF FF 20 50 76
C2F0:55 34 4D 00 FF FF 30 48 80
C2F8:44 21 58 05 FF FF 20 58 DC
C300:45 44 25 18 FF 00 00 10 71
C308:00 00 10 30 4E 41 40 30 BC
C310:0F FF 00 00 20 00 00 20 40
C318:60 1C 0A 09 69 1E FF 20 8C
C320:40 60 40 20 00 05 03 07 0B
C328:03 05 00 FF FF 60 1C 0A 36
C330:09 69 1E FF FF 40 79 4F 9D
C338:49 49 36 FF FF 20 58 46 F4
C340:41 21 02 FF FF 40 71 4F 24
C348:41 21 1E FF FF 60 58 4F FD
C350:49 49 01 FF FF 60 18 0F AF
C358:09 09 01 FF FF 20 58 46 3E
C360:51 31 12 FF FF 60 18 0F DF
C368:68 18 07 FF FF 00 40 60 EB
C370:59 07 01 FF FF 20 40 40 C7
C378:31 0F 01 FF FF 60 1E 09 43
C380:34 42 01 FF FF 60 58 47 4C
C388:40 40 00 FF FF 60 1F 02 02
C390:0C 62 1F FF FF 60 1E 05 5D
C398:18 60 1F FF FF 20 5C 42 A3
C3A0:41 21 1E FF FF 60 1C 0B 99
C3A8:09 09 06 FF FF 20 5C 42 33
C3B0:51 21 5E FF FF 60 1C 0B B9
C3B8:19 29 46 FF FF 20 46 45 32
C3C0:49 29 12 FF FF 00 00 61 DA
C3C8:19 07 01 FF FF 30 4E 41 5D
C3D0:40 30 0F FF FF 00 1E 61 04
C3D8:10 08 07 FF FF 00 7E 21 69
C3E0:18 60 1F FF FF 60 16 09 27
C3E8:18 64 03 FF FF 00 06 69 6B
C3F0:18 08 07 FF FF 60 50 49 D2
C3F8:49 45 03 FF 00 60 00 00 58
C400:00 00 01 0F 01 00 00 00 A2
C408:FF 00 00 00 00 00 00 00 91
```

Program 6: Cursive Font

See instructions in article on page 60 before typing in.

```
C000:8B 00 22 08 2C 0D 3B 0D 25
C008:41 08 42 08 43 08 44 08 BF
C010:45 08 46 0D 47 0D 48 08 D6
C018:49 08 4A 0D 4B 08 4C 0D 7A
C020:4D 08 4E 08 4F 08 50 0D DC
C028:51 0D 52 08 53 08 54 08 CB
C030:55 08 56 08 57 08 58 08 3D
C038:59 0D 5A 0D 5C 0D 80 0D EA
C040:81 0D 82 0D 83 0D 84 0D 4D
C048:85 0D 86 0D 87 0D 88 0D FF
C050:89 0D 8E 08 A6 0D AF 0D 02
C058:B0 08 B8 08 B9 08 BE 0D 44
C060:BF 0D C0 0D C1 08 C2 08 A9
C068:C4 08 C5 08 C6 08 C8 08 77
C070:C9 08 CA 0D CB 08 CC 08 23
C078:CD 08 CE 08 CF 08 D0 08 85
C080:D2 08 D4 08 D5 08 D7 08 0F
C088:D9 0D DB 0D 00 FF 00 07 8D
C090:00 07 00 00 FF FF 00 00 D3
C098:40 00 00 00 00 04 03 00 50
C0A0:00 00 FF 00 00 48 00 00 43
C0A8:00 00 04 03 00 00 00 FF DA
C0B0:40 38 44 44 7C 40 FF FF 12
C0B8:40 3F 40 44 38 40 FF FF 39
C0C0:40 38 44 44 48 40 FF FF 80
C0C8:40 38 44 44 3F 40 FF FF 40
C0D0:78 64 54 54 48 40 FF FF BA
C0D8:40 7E 21 5E 40 40 00 1F 46
C0E0:20 1F 00 00 FF 40 38 44 EF
C0E8:44 78 40 00 1C 22 21 1F 7D
C0F0:00 FF 40 3F 08 04 38 40 6F
C0F8:FF FF 40 20 3D 40 40 40 30
C100:FF FF 40 20 10 7D 40 40 C4
C108:1C 22 21 1F 00 00 FF 40 78
C110:3F 10 28 44 40 FF 00 00 82
C118:40 00 00 00 40 5F 20 5F DA
C120:40 40 FF FF 7C 04 38 04 3C
C128:78 40 FF FF 40 7C 04 04 F7
C130:78 40 FF FF 40 38 44 44 AF
C138:38 00 FF FF 40 38 44 44 87
C140:38 40 00 1F 00 00 00 00 E1
C148:FF 40 38 44 44 38 40 00 AA
C150:00 00 3F 22 1C FF 40 3C 7B
C158:08 38 40 40 FF FF 48 54 DE
C160:54 54 20 40 FF FF 44 44 F7
C168:3F 24 44 44 FF FF 40 3C 1E
C170:40 40 3C 40 FF FF 38 44 64
C178:20 30 4C 40 FF FF 3C 40 5E
C180:30 40 3C 40 FF FF 44 28 68
C188:10 28 44 40 FF FF 40 3C 67
C190:40 40 3C 40 00 18 24 22 9A
C198:1F 00 FF 40 30 08 08 70 D1
C1A0:40 00 18 24 22 1F 00 00 17
C1A8:00 40 40 00 00 40 3F 44 08
C1B0:44 3B 00 FF 70 08 48 28 81
C1B8:70 00 03 05 04 04 03 00 5B
C1C0:FF 00 10 78 00 00 00 00 CD
C1C8:04 07 04 00 00 FF 10 08 B8
C1D0:08 48 30 00 06 05 05 04 C2
C1D8:04 00 FF 10 08 48 48 30 81
C1E0:00 02 04 04 04 03 00 FF D1
C1E8:40 20 10 78 00 00 01 01 21
C1F0:01 07 01 00 FF 38 28 28 30
C1F8:28 68 00 02 04 04 04 03 06
C200:00 FF 60 50 48 48 48 00 8A
C208:03 04 04 04 03 00 FF 08 F0
C210:08 48 28 18 00 00 07 00 40
C218:00 00 00 FF 30 48 48 48 19
C220:30 00 03 04 04 04 03 00 94
C228:FF 30 48 48 48 70 00 04 4F
C230:04 04 02 01 00 FF FF 00 09
C238:00 70 00 70 00 FF 00 60 41
C240:00 00 60 00 01 0F 01 01 19
C248:0F 01 FF 00 20 00 20 00 D6
C250:00 3E 41 47 49 3E 08 FF 55
C258:FF 40 38 45 44 7D 40 FF E1
C260:FF 40 3D 40 40 3D 40 FF 19
C268:FF 40 39 44 44 39 00 FF 70
C270:00 20 00 20 00 00 3F 40 BE
C278:40 40 3F 40 FF 00 00 20 3A
C280:00 20 00 3C 42 41 41 3F AA
C288:40 FF 20 40 60 40 20 00 7A
C290:05 03 07 03 05 00 FF FF 92
C298:3C 42 41 41 3F 40 FF FF 04
C2A0:7F 41 49 4E 30 00 FF FF C5
C2A8:42 79 41 41 3E 00 FF FF DB
C2B0:36 49 49 41 22 00 FF FF F1
C2B8:02 49 3D 09 09 00 FF FF 12
C2C0:7E 09 08 48 3F 00 FF FF 47
C2C8:42 41 7F 41 21 00 FF FF CC
C2D0:3C 42 41 41 7F 40 00 18 56
C2D8:24 22 1F 00 FF 7F 08 08 F2
C2E0:14 23 40 FF FF 41 7E 40 83
C2E8:40 40 40 FF FF 7E 01 0E B0
C2F0:41 3E 00 FF FF 7F 02 01 A9
C2F8:01 3E 40 FF FF 3E 41 47 59
C300:49 3E 08 FF FF 01 7D 09 C4
C308:09 06 00 FF FF 7D 09 19 B6
C310:29 46 40 FF FF 02 01 7D 4D
C318:01 01 00 FF FF 3F 40 40 1E
C320:40 3F 40 FF FF 3F 40 30 4D
C328:40 3F 00 FF FF 3E 41 40 5B
C330:40 7F 00 10 20 20 20 1F 99
C338:00 00 60 00 00 00 00 01 CC
C340:0F 01 00 00 00 FF 00 00 8F
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

64 Compressor

See instructions in article on page 73 before typing in.

```
C000:20 7B C4 A9 08 C5 2E D0 28
C008:03 4C DE C3 20 B5 C0 A5 35
C010:2B 8D 9B C2 A5 2C 8D 9C BF
C018:C2 A5 2D 18 69 02 8D 9D 97
C020:C2 A5 2E 69 00 8D 9E C2 FE
C028:20 C7 C0 20 09 C1 20 A5 FA
C030:C2 20 D7 C2 F0 01 60 A5 34
C038:2D 85 FB A5 2E 85 FC A5 B2
C040:2D 38 E9 01 85 FD A5 2E 51
C048:E9 08 85 FE A9 01 18 65 48
```

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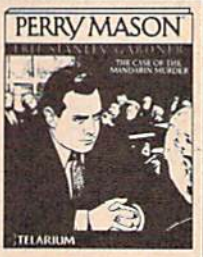

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C058:FE A9 01 8D A3 C2 A9 08 40
C060:8D A4 C2 20 65 C5 A5 2D E6
C068:8D 1F C6 A5 2E 8D 20 C6 5A
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C098:01 85 01 20 5B C1 A9 01 54
C0A0:05 01 85 01 A5 FD 85 2D 03
C0A8:85 2F 85 31 A5 FE 85 2E DE
C0B0:85 30 85 32 60 A2 00 A9 0C
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C0C8:9B C2 85 FB AD 9C C2 85 24
C0D0:FC CD 9E C2 F0 19 A0 00 71
C0D8:B1 FB AA FE 00 CE D0 03 57
C0E0:FE 00 CF C8 D0 F2 E6 FC 85
C0E8:AD 9E C2 C5 FC D0 E7 A0 39
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C110:00 CF DD 01 CF F0 05 B0 50
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C128:E6 E6 FB D0 E0 60 BD 00 69
C130:CD A8 BD 01 CD 9D 00 CD 3F
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C168:09 85 FE A9 01 85 FB A9 0C
C170:28 85 FC A0 00 B1 FB 85 57
C178:62 AA BD 00 CC C9 0F 90 CB
C180:60 C9 1E 90 4A C9 2D 90 D7
C188:49 C9 3C 90 48 C9 4B 90 44
C190:47 C9 5A 90 46 C9 69 90 3B
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C1A0:D0 F9 A2 08 26 62 20 7C 57
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C1B0:E6 FC AD 9E C2 C5 FC D0 7E
C1B8:BA AD 9D C2 C5 FB F0 03 E7
C1C0:4C 73 C1 AD A2 C2 F0 06 62
C1C8:20 7C C2 4C C3 C1 60 4C CA
C1D0:F5 C1 4C 04 C2 4C 13 C2 B9
C1D8:4C 22 C2 4C 3C C2 4C 5A 08
C1E0:C2 38 2A 2A 2A 2A 85 62 23
C1E8:A2 05 26 62 20 7C C2 CA 2D
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C208:0A 38 2A 2A 85 62 A2 07 8A
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C220:EA C1 38 E9 3C 0A 0A 0A 59
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C2C8:DC C4 9D 01 08 BD DC C5 68
C2D0:9D 01 09 CA D0 F1 60 A2 E4
C2D8:00 86 FB 86 FC 86 FD A9 8F
C2E0:0F 85 FE 20 5E C4 20 15 8C
C2E8:C4 20 0E C4 20 0E C4 20 C9
C2F0:22 C4 20 36 C4 A9 1E 85 AE
C2F8:FE 20 5E C4 20 0E C4 20 01
C300:15 C4 20 0E C4 20 22 C4 D7
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C318:20 4A C4 20 0E C4 20 22 C2
C320:C4 20 36 C4 A9 3C 85 FE 6D
C328:20 5E C4 20 0E C4 20 0E C3
C330:C4 20 0E C4 20 36 C4 A9 3D
C338:4B 85 FE 20 5E C4 20 15 04
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C350:A9 5A 85 FE 20 5E C4 20 08
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C3F8:47 52 41 4D 20 44 4F 45 AB
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C408:4D 50 52 45 53 53 06 62 41
C410:26 63 26 64 60 A5 62 85 74
C418:65 A5 63 85 6A A5 64 85 BA
C420:6B 60 A5 65 18 65 62 85 23
C428:62 A5 6A 65 63 85 63 A5 8D
C430:6B 65 64 85 64 60 A5 FB 99
C438:18 65 62 85 FB A5 FC 65 A1
C440:63 85 FC A5 FD 65 64 85 AA
C448:FD 60 A5 65 18 65 62 85 94
C450:65 A5 6A 65 63 85 6A A5 45
C458:6B 65 64 85 6B 60 A9 00 06
C460:85 62 85 63 85 64 BD 00 65
C468:CE 18 65 62 85 62 BD 00 63
C470:CF 65 63 85 63 E8 E4 FE 87
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C490:20 43 4F 4D 50 52 45 53 63
C498:53 4F 52 3A 20 50 52 4F C3
C4A0:47 52 41 4D 20 43 4F 4D 59
C4A8:50 41 43 54 4F 52 20 20 7C
C4B0:20 20 20 20 20 20 28 43 6D
C4B8:29 20 20 31 39 38 38 20 31
C4C0:20 43 4F 4D 50 55 54 45 AF
C4C8:21 20 50 55 42 4C 49 43 63
C4D0:41 54 49 4F 4E 53 20 20 4E
C4D8:20 20 92 0D 10 08 0A 00 52
C4E0:9E 32 30 37 30 20 20 20 22
C4E8:20 20 20 00 00 00 52 D5 09
C4F0:0D A2 00 BD 01 08 9D DC C5
C4F8:C4 BD 01 09 9D DC C5 CA BB
C500:D0 F1 4C 05 C5 A5 2D 85 EE
C508:FB A5 2E 85 FC A5 FB 38 C7
C510:E9 AF 85 FD A5 FC E9 09 0B
C518:85 FE A9 AF 8D A3 C2 A9 80
C520:09 8D A4 C2 A9 01 18 65 3B
C528:FD 85 FD A9 28 65 FE 85 C8
C530:FE 20 65 C5 A9 FE 25 01 E0
C538:85 01 20 8D C5 A9 01 05 7F
C540:01 85 01 AD 1F C6 85 2D F4
C548:85 2F 85 31 AD 20 C6 85 27
C550:2E 85 30 85 32 A2 03 86 5B
C558:C6 BD ED C4 9D 76 02 CA 56
C560:D0 F7 4C 66 FE A0 00 B1 6E
C568:FB 91 FD A5 FB CD A3 C2 91
C570:D0 08 A5 FC CD A4 C2 D0 42
C578:01 60 A5 FB D0 02 C6 FC 2A
C580:C6 FB A5 FD D0 02 C6 FE 1E
C588:C6 FD 4C 67 C5 8C A2 C2 5F
C590:A9 01 85 FD A9 28 85 FE B9
C598:A9 01 85 FB A9 08 85 FC 1F
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C5A8:FC C5 26 62 20 FC C5 26 B5
C5B0:62 20 FC C5 26 62 20 FC 69
C5B8:C5 26 62 A5 62 C9 0F F0 A0
C5C0:2C 20 FC C5 A5 62 B0 07 85
C5C8:69 0F 85 62 4C C1 C5 AA 43
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C5D8:20 C6 D0 08 A5 FB CD 1F 98
C5E0:C6 D0 01 60 E6 FB D0 02 F4
C5E8:E6 FC 4C A5 C5 A2 08 20 F3
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C5F8:62 4C D3 C5 EE A2 C2 AD D4
C600:A2 C2 C9 09 F0 04 2E A1 EE
C608:C2 60 8C A2 C2 E6 FD D0 49
C610:02 E6 FE B1 FD 8D A1 C2 7F
C618:EE A2 C2 2E A1 C2 60 00 D9
C620:00 00 00 00 00 00 00 00 AD
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Scorpion II

See instructions in article on page 46 before typing in.

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0859:90 98 9A A2 AA AE B4 B1 80
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0869:B6 B1 B6 B1 B6 B1 B6 B1 CE
0871:B6 B1 B6 B1 7F 77 63 41 1D
0879:7F 77 63 41 F0 00 00 FE 2E
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0899:FF FF 01 FF FF 00 3F FF 48
08A1:00 7F FF 00 7F FF 00 00 8D
08A9:FF 00 00 07 00 00 01 00 2C
08B1:00 00 00 00 00 00 00 00 C1
08B9:00 00 00 00 FF FF 00 80 4A
08C1:01 00 80 01 00 9F F9 00 E4
08C9:9F F9 00 9F F9 00 9F F9 2B
08D1:00 9F F9 00 9F F9 00 9F 8D
08D9:F9 00 9F F9 00 9F F9 00 EC
08E1:9F F9 00 9F F9 00 9F F9 43
08E9:00 80 01 00 80 01 00 FF 42
08F1:FF 00 00 00 00 00 00 00 02
08F9:00 00 00 00 FF FF 00 FF 0A
0901:FF 00 FF FF 00 FF FF 00 13
0909:FF FF 00 FF FF 00 FF FF 1B
0911:00 FF FF 00 FF FF 00 FF 23
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0921:FF FF 00 FF FF 00 FF FF 33
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0931:FF 00 00 00 00 00 00 00 43
0939:00 00 00 00 FF FF 00 80 CB
0941:01 00 83 C1 00 86 61 00 3D
0949:8C 31 00 8F F1 00 8C 31 C0
0951:00 8C 31 83 E1 00 86 31 32
0959:00 80 61 00 83 C1 00 86 61
0961:01 00 87 F1 87 E1 00 80 48
0969:31 00 81 E1 00 80 31 00 C6
0971:80 31 00 87 E1 81 E1 00 61
0979:83 61 00 86 61 00 8C 61 93
0981:00 8F F1 00 80 61 87 F1 40
0989:00 86 01 00 87 E1 00 80 A1
0991:31 00 80 31 00 87 E1 83 C4
0999:C1 00 86 01 00 87 C1 00 0F
09A1:86 61 00 86 61 00 83 C1 8B
09A9:87 F1 00 86 31 00 80 31 20
09B1:00 80 61 00 80 C1 00 81 9C
09B9:81 87 E1 00 8C 31 00 87 5B
09C1:E1 00 8C 31 00 8C 31 00 FD
09C9:87 E1 87 E1 00 8C 31 00 BB
09D1:87 F1 00 80 31 00 80 31 E7
09D9:00 87 E1 98 F1 00 99 99 EF
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17A1:D4 60 A2 0A A9 00 9D F5 C5
17A9:CF CA D0 FA 20 91 18 20 D3
17B1:FC 18 A9 34 8D C0 CF 20 0C
17B9:A9 0C A9 00 8D 00 75 20 6C
17C1:F9 12 20 BA 11 20 91 18 65
17C9:AD FA CF F0 2A AD FF CF 6E
17D1:F0 0D AD FA CF 30 05 EE 59
17D9:FD CF 10 03 EE FE CF 20 60
17E1:20 18 20 DF 19 20 E4 FF 3B
17E9:29 7F C9 31 F0 C1 C9 32 2D
17F1:F0 C0 C9 33 D0 EF 60 20 5C
17F9:19 1A 20 E4 FF 29 7F C9 FA
1801:31 F0 0E C9 32 D0 F3 AD CE
1809:FF CF F0 D3 EE FE CF 10 AB
1811:CE 20 68 0B A9 01 8D 15 EF
1819:D0 20 15 14 18 90 A3 A2 8A
1821:0C A0 0C 18 20 F0 FF A2 E9
1829:16 BD 82 19 20 D2 FF CA CC
1831:D0 F7 AD FD CF 85 70 20 F2
1839:51 18 A2 0C A0 19 18 20 E6
1841:F0 FF AD FE CF 85 70 20 25
1849:51 18 A9 00 8D FF CF 60 C9
1851:20 5F 18 A5 6F 20 D2 FF 68
1859:A5 70 20 D2 FF 60 A9 00 7E
1861:85 6F A5 70 38 E9 0A 10 79
1869:16 18 A5 70 69 30 85 70 ED
1871:A5 6F F0 06 18 69 30 85 1B
1879:6F 60 A9 20 85 6F 60 85 E0
1881:70 E6 6F A5 6F C9 0A 90 33
1889:D9 A9 23 85 6F 85 70 60 A0
1891:A9 06 8D 20 D0 A9 0F 8D A4
1899:21 D0 A9 93 20 D2 FF A9 F2
18A1:12 20 D2 FF A9 81 20 D2 A3
18A9:FF A2 05 A0 0B 18 20 F0 17
18B1:FF A0 11 A9 20 20 D2 FF ED
18B9:88 D0 FA E8 E0 0A D0 EB 0D
18C1:A9 90 20 D2 FF A2 06 A0 53
18C9:0D 18 20 F0 FF A0 0D A9 DF
18D1:20 20 D2 FF 88 D0 FA E8 DA
18D9:E0 09 D0 EB A2 07 A0 0E 16
18E1:18 20 F0 FF A2 0B BD F0 F1
18E9:18 20 D2 FF CA D0 F7 60 72
18F1:49 49 2D 4E 4F 49 50 52 36
18F9:4F 43 53 EE FF CF A2 16 96
1901:A0 0A 18 20 F0 FF A2 16 ED
1909:BD 6C 19 20 D2 FF CA D0 57
1911:F7 E8 8E C0 CF AD 04 DC 71
1919:29 3F F0 F9 C9 35 B0 F5 E7
1921:9D C0 CF AC 00 75 F0 13 E1
1929:B9 00 75 29 3F F0 09 C9 13
1931:35 B0 05 85 02 20 39 12 38
1939:88 D0 ED AD 04 DC 29 3F A1
1941:F0 F9 C9 35 B0 F5 85 02 61
1949:20 39 12 AD C0 CF C9 34 04
1951:F0 13 C9 33 D0 E5 A0 35 C1
1959:88 84 02 20 39 12 AD C0 61
1961:CF C9 34 D0 F3 20 A9 0C 01
1969:20 A9 0C 60 20 2E 2E 2E E1
1971:53 44 52 41 43 20 47 4E 34
1979:49 4C 46 46 55 48 53 20 23
1981:81 12 9D 9D 9D 9D 9D C2
1989:9D 9D 54 53 4F 4C 20 20 BD
1991:20 20 20 4E 4F 57 1F 92 6D
1999:45 55 4E 49 54 4E 4F 43 DF
19A1:20 92 31 96 12 55 4E 45 DF
19A9:4D 20 4E 49 41 4D 20 92 FA
19B1:32 12 4E 49 41 47 41 20 A9
19B9:59 41 4C 50 20 92 31 96 BB
19C1:12 53 44 52 41 43 20 45 1C
19C9:4D 41 53 20 59 41 4C 50 18
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19D1:45 52 20 92 32 12 54 49 34
19D9:55 51 20 92 33 12 A2 0F 6E
19E1:A0 0B 18 20 F0 FF A2 0F 08
19E9:BD B2 19 20 D2 FF CA D0 C9
19F1:F7 A2 11 A0 0B 18 20 F0 DE
19F9:FF A2 15 BD C1 19 20 D2 D8
1A01:FF CA D0 F7 A2 13 A0 0B 2F
1A09:18 20 F0 FF A2 08 BD D6 F6
1A11:19 20 D2 FF CA D0 F7 60 1E
1A19:A2 0F A0 0D 18 20 F0 FF 6A
1A21:A2 0D BD 98 19 20 D2 FF 1A
1A29:CA D0 F7 A2 11 A0 0D 18 5D
1A31:20 F0 FF A2 0D BD A5 19 9F
1A39:20 D2 FF CA D0 F7 60 00 06
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BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

RAM Save

Article on page 65.

```
HE 10 REM COPYRIGHT 1988 COMPU
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       ALL RIGHTS RESERVED
MG 20 FORI=49152TO49381:READA:
      POKEI,A:X=X+A:NEXT
QJ 30 IFX<>35805THENPRINT"ERRO
      R IN DATA STATEMENTS":EN
      D
DK 40 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1988 COMPUTE! PUB
      ., INC."
JB 50 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
EC 60 PRINT"{2 DOWN}64 KERNAL
      {SPACE}RAM SAVE IS {YEL}
      ACTIVE{WHT}."
SR 70 PRINT"{2 DOWN}CALL USING
       THE FOLLOWING:"
XM 80 PRINT"{DOWN}SYS49152,S-6
      5536,E-65535,N$"
XG 90 PRINT"{2 DOWN}WHERE S IS
       STARTING ADDRESS,"
XB 100 PRINTTAB(8)"E IS ENDING
       ADDRESS,"
AR 110 PRINTTAB(8)"N$ IS FILE
      {SPACE}NAME + ',P,W'"
CR 120 DATA32,253,174,32,158,1
      73,32,170,177,141
FS 130 DATA234,192,140,233,192
      ,32,253,174,32,158
PC 140 DATA173,32,170,177,141,
      236,192,140,235,192
DM 150 DATA32,253,174,32,158,1
      73,160,0,177,71
DE 160 DATA141,230,192,200,177
      ,71,141,231,192,200
PR 170 DATA177,71,141,232,192,
      162,8,138,160,2
FG 180 DATA32,186,255,160,0,17
      3,230,192,174,231
AG 190 DATA192,172,232,192,32,
      189,255,32,192,255
MX 200 DATA162,8,32,201,255,17
      3,233,192,133,253
CF 210 DATA32,210,255,173,234,
      192,133,254,32,210
RX 220 DATA255,32,125,192,56,1
      73,235,192,237,233
MM 230 DATA192,133,251,173,236
      ,192,237,234,192,133
GP 240 DATA252,32,162,192,96,1
      20,165,1,41,248
FG 250 DATA133,1,96,165,1,9,7,
      133,1,88
XE 260 DATA96,32,133,192,162,0
      ,189,0,207,32
SD 270 DATA210,255,232,236,237
      ,192,208,244,32,125
RP 280 DATA192,96,166,252,240,
      27,202,134,252,160
FA 290 DATA0,162,0,177,253,157
      ,0,207,232,200
JH 300 DATA208,247,140,237,192
      ,32,141,192,230,254
MK 310 DATA76,162,192,166,251,
      164,251,240,19,142
AH 320 DATA237,192,202,136,177
      ,253,157,0,207,136
QM 330 DATA202,224,255,208,245
      ,32,141,192,32,133
MS 340 DATA192,32,204,255,169,
      8,32,195,255,96
```

Maze Master

See instructions in article on page 54 before typing in.

```
C000:A9 93 20 D2 FF A9 50 8D 41
C008:CB C7 A9 64 8D 3C 03 A9 E9
C010:3F 8D 3D 03 A9 34 85 C3 59
C018:A9 40 85 C4 A9 A1 8D 43 AD
C020:03 A9 42 8D 44 03 A9 71 A1
C028:85 C6 A9 43 85 C7 20 37 4A
C030:C0 20 E9 C1 4C 8B C3 A9 35
C038:01 8D 21 D0 A9 02 8D 34 73
C040:C5 A9 60 8D 7A C6 A9 01 37
C048:8D 7B C6 A2 02 A9 FD 9D C2
C050:34 03 A9 FC 9D 37 03 CA 4C
C058:10 F3 A9 00 8D 12 D0 AD 18
C060:11 D0 29 7F 8D 11 D0 A0 AE
C068:07 A9 00 99 00 39 88 10 77
C070:FA 60 AD 3C 03 8D 97 C0 3F
C078:AD 3D 03 8D 98 C0 A9 CB 40
C080:8D 9A C0 A9 04 8D 9B C0 70
C088:A2 0A A9 00 8D 3F 03 AD 30
C090:11 D0 10 FB A0 0F B9 F6 3C
C098:65 99 F8 06 88 98 C9 00 EC
C0A0:D0 F4 18 AD 9A C0 69 28 78
C0A8:8D 9A C0 AD 9B C0 69 00 3D
C0B0:8D 9B C0 18 AD 97 C0 69 30
C0B8:28 8D 97 C0 AD 98 C0 69 6B
C0C0:00 8D 98 C0 CA D0 CD AD A7
C0C8:43 03 8D EC C0 AD 44 03 75
C0D0:8D ED C0 A9 DC 8D EF C0 05
C0D8:A9 04 8D F0 C0 A2 0A A9 3F
C0E0:00 8D 3F 03 AD 11 D0 10 41
C0E8:FB A0 0F B9 F6 65 99 F8 87
C0F0:06 88 98 C9 00 D0 F4 AD 22
C0F8:EF C0 18 69 28 8D EF C0 54
C100:AD F0 C0 69 00 8D F0 C0 1E
C108:AD EC C0 18 69 28 8D EC 2B
C110:C0 AD ED C0 69 00 8D ED 7D
C118:C0 CA D0 CD 60 18 AD 3C A0
C120:03 69 28 8D 3C 03 AD 3D E3
C128:03 69 00 8D 3D 03 18 A5 2C
C130:C3 69 28 85 C3 A5 C4 69 F4
C138:00 85 C4 60 38 AD 3C 03 AF
C140:E9 28 8D 3C 03 AD 3D 03 84
C148:E9 00 8D 3D 03 38 A5 C3 4E
C150:E9 28 85 C3 A5 C4 E9 00 D3
C158:85 C4 60 18 AD 3C 03 69 2B
C160:01 8D 3C 03 AD 3D 03 69 51
C168:00 8D 3D 03 E6 C3 60 AD DB
C170:3C 03 38 E9 01 8D 3C 03 32
C178:AD 3D 03 E9 00 8D 3D 03 D4
C180:C6 C3 60 38 AD 43 03 E9 52
C188:28 8D 43 03 AD 44 03 E9 8A
C190:00 8D 44 03 38 A5 C6 E9 FF
C198:28 85 C6 A5 C7 E9 00 85 30
C1A0:C7 60 18 AD 43 03 69 28 1F
C1A8:8D 43 03 AD 44 03 69 00 FF
C1B0:8D 44 03 18 A5 C6 69 28 31
C1B8:85 C6 A5 C7 69 00 85 C7 FF
C1C0:60 18 AD 43 03 69 01 8D B1
C1C8:43 03 AD 44 03 69 00 8D F3
C1D0:44 03 E6 C6 60 38 AD 43 03
C1D8:03 E9 01 8D 43 03 AD 44 17
C1E0:03 E9 00 8D 44 03 C6 C6 BB
C1E8:60 A9 64 85 AA A9 3F 85 EB
C1F0:A9 85 AB A0 00 A9 20 91 A2
C1F8:AA C8 C0 2D D0 F9 18 A5 33
C200:AA 69 28 85 AA 90 02 E6 15
C208:AB E8 E0 2E D0 E5 A9 51 5F
C210:85 A8 A9 0A 85 AA A9 40 C2
C218:85 A9 85 AB A2 00 A0 00 8C
C220:A9 A0 91 AA C8 C0 21 D0 DB
C228:F9 18 A5 AA 69 28 85 AA B1
C230:90 02 E6 AB E8 E0 17 D0 DF
C238:E5 A0 00 A9 04 91 A8 20 4B
C240:97 E0 A5 8F 29 03 85 A5 7D
C248:AA 0A A8 18 B9 08 C5 65 1B
C250:A8 85 B4 B9 09 C5 65 A9 91
C258:85 B5 18 B9 08 C5 65 B4 83
C260:85 AA B9 09 C5 65 B5 85 CF
C268:AB A0 00 B1 AA C9 A0 D0 95
C270:12 8A 91 AA A9 2E 91 B4 5C
C278:A5 AA 85 A8 A5 AB 85 A9 47
C280:4C 3F C2 E8 8A 29 03 C5 A7
C288:A5 D0 BD B1 A8 AA A9 2E 59
C290:91 A8 E0 04 F0 1A 8A 0A 74
C298:A8 A2 02 38 A5 A8 F9 08 AA
C2A0:C5 85 A8 A5 A9 F9 09 C5 E6
C2A8:85 A9 CA D0 EE 4C 3F C2 AB
C2B0:20 AC C7 60 A9 73 85 FB 92
C2B8:A9 05 85 FC A0 00 B1 FB 39
C2C0:C9 A0 F0 08 20 3C C1 A9 11
C2C8:01 8D 3C C5 60 A9 84 85 4E
C2D0:FB A9 05 85 FC A0 00 B1 D3
C2D8:FB C9 A0 F0 03 20 83 C1 53
C2E0:60 A9 C3 85 FB A9 05 85 E7
C2E8:FC A0 00 B1 FB C9 A0 F0 69
C2F0:08 20 1D C1 A9 01 8D 3C EA
C2F8:C5 60 A9 D4 85 FB A9 05 70
C300:85 FC A0 00 B1 FB C9 A0 4F
C308:F0 03 20 A2 C1 60 A9 9C 76
C310:85 FB A9 05 85 FC A0 00 40
C318:B1 FB C9 A0 F0 08 20 5B FD
C320:C1 A9 01 8D 3C C5 60 A9 4F
C328:AD 85 FB A9 05 85 FC A0 DA
C330:00 B1 FB C9 A0 F0 03 20 2F
C338:C1 C1 60 A9 9A 85 FB A9 44
C340:05 85 FC A0 00 B1 FB C9 DD
C348:A0 F0 08 20 6F C1 A9 01 36
C350:8D 3C C5 60 A9 AB 85 FB 6F
C358:A9 05 85 FC A0 00 B1 FB DA
C360:C9 A0 F0 03 20 D5 C1 60 7F
C368:A9 2A 8D 9B 05 A9 00 8D 17
C370:9B D9 A9 51 8D AC 05 A9 59
C378:00 8D AC D9 60 AE CB C7 B3
C380:A0 C8 88 98 D0 FC CA 8A BF
C388:D0 F6 60 A9 00 8D 72 C6 BE
C390:8D 73 C6 8D 76 C6 8D 77 CE
C398:C6 20 D2 C7 20 8A C6 AD C8
C3A0:00 DC C9 7E D0 03 20 CD 21
C3A8:C2 AD 00 DC C9 7D D0 03 B3
C3B0:20 FA C2 AD 00 DC C9 77 B8
C3B8:D0 03 20 27 C3 AD 00 DC 91
C3C0:C9 7B D0 03 20 54 C3 20 50
C3C8:3B C4 A0 00 B1 C3 C9 2E 91
C3D0:D0 13 A0 00 A9 20 91 C3 4E
C3D8:A9 11 8D 04 D4 A9 10 8D 66
C3E0:04 D4 20 44 C5 A0 00 B1 4A
C3E8:C6 C9 2E D0 13 A0 00 A9 DD
C3F0:20 91 C6 A9 11 8D 0B D4 0A
C3F8:A9 10 8D 0B D4 20 5B C5 5F
C400:A5 C5 C9 04 D0 08 A9 50 91
C408:8D CB C7 4C 2F C4 C9 05 2E
C410:D0 08 A9 28 8D CB C7 4C 33
C418:2F C4 C9 06 D0 08 A9 14 12
C420:8D CB C7 4C 2F C4 C9 03 44
C428:D0 05 A9 01 8D CB C7 20 EB
C430:72 C0 20 68 C3 20 7D C3 0B
C438:4C 9F C3 AD 34 C5 C9 02 71
C440:D0 2C A9 00 8D 3C C5 20 7B
C448:3B C3 AD 3C C5 F0 06 A9 81
C450:04 8D 34 C5 60 A9 00 8D 59
C458:3C C5 20 E1 C2 AD 3C C5 9E
C460:F0 06 A9 02 8D 34 C5 60 62
C468:A9 01 8D 34 C5 60 AD 34 3B
C470:C5 C9 03 D0 2C A9 00 8D 52
```

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Star NX-1000C	$CALL	**Joysticks/Controllers**		**Disk Drives**	
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		Data Transfer Switch	$24.95	**Ribbons**	
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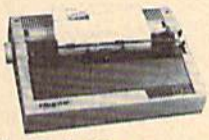

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C478:3C C5 20 E1 C2 AD 3C C5 BE
C480:F0 06 A9 02 8D 34 C5 60 82
C488:A9 00 8D 3C C5 20 0E C3 EA
C490:AD 3C C5 F0 06 A9 03 8D 32
C498:34 C5 60 A9 04 8D 34 C5 D8
C4A0:60 AD 34 C5 C9 01 D0 2C C8
C4A8:A9 00 8D 3C C5 20 0E C3 0B
C4B0:AD 3C C5 F0 06 A9 03 8D 52
C4B8:34 C5 60 A9 00 8D 3C C5 E8
C4C0:20 B4 C2 AD 3C C5 F0 06 9B
C4C8:A9 01 8D 34 C5 60 A9 02 61
C4D0:8D 34 C5 60 AD 34 C5 C9 80
C4D8:04 D0 2C A9 00 8D 3C C5 2D
C4E0:20 B4 C2 AD 3C C5 F0 06 BB
C4E8:A9 01 8D 34 C5 60 A9 00 7F
C4F0:8D 3C C5 20 3B C3 AD 3C 8B
C4F8:C5 F0 06 A9 04 8D 34 C5 81
C500:60 A9 03 8D 34 C5 60 60 39
C508:01 00 D8 FF FF FF 28 00 7F
C510:25 21 22 24 A0 20 3A 66 5D
C518:AA BA 7F FF 13 03 0F 12 6C
C520:05 3A 20 30 00 08 09 07 FC
C528:08 3A 00 87 81 8D 85 A0 AC
C530:8F 96 85 92 00 00 00 00 03
C538:00 00 00 00 00 00 00 00 C3
C540:00 00 00 00 18 AD 72 C6 EE
C548:69 01 8D 72 C6 AD 73 C6 3C
C550:69 00 8D 73 C6 20 EE C5 D3
C558:4C 6F C5 18 AD 76 C6 69 5E
C560:01 8D 76 C6 AD 77 C6 69 4D
C568:00 8D 77 C6 20 EE C5 38 33
C570:AD 7A C6 E9 01 8D 7A C6 E2
C578:AD 7B C6 E9 00 8D 7B C6 25
C580:20 EE C5 18 AD 76 C6 6D 54
C588:7A C6 8D 1A C8 AD 77 C6 09
C590:6D 7B C6 8D 1B C8 18 AD 3D
C598:72 C6 6D 7A C6 8D 2A C8 ED
C5A0:AD 73 C6 6D 7B C6 8D 2B CC
C5A8:C8 AD 72 C6 CD 1A C8 90 B7
C5B0:15 AD 73 C6 CD 1B C8 90 0A
C5B8:0D A9 CC 8D 86 C8 A9 D8 2B
C5C0:8D 88 C8 4C 3A C8 AD 76 D9
C5C8:C6 CD 2A C8 90 15 AD 77 A8
C5D0:C6 CD 2B C8 90 0D A9 DD 0F
C5D8:8D 86 C8 A9 D8 8D 88 C8 57
C5E0:4C 3A C8 60 A9 C8 8D A7 73
C5E8:02 A9 FA 8D A8 02 AD 72 33
C5F0:C6 85 FD AD 73 C6 85 FE 9C
C5F8:A9 09 8D 78 C6 20 25 C6 9C
C600:AD 76 C6 85 FD AD 77 C6 8F
C608:85 FE A9 19 8D 78 C6 20 DA
C610:25 C6 AD 7A C6 85 FD AD 35
C618:7B C6 85 FE A9 61 8D 78 1C
C620:C6 20 25 C6 60 A0 09 A9 6B
C628:00 8D 20 CB A5 FD D9 5B 0E
C630:C6 A5 FE F9 5C C6 90 14 3D
C638:A5 FD 38 F9 5B C6 85 FD BD
C640:A5 FE F9 5C C6 85 FE EE 9E
C648:20 CB D0 E0 AD 20 CB 20 A6
C650:66 C6 A9 00 8D 20 CB 88 05
C658:88 10 D1 60 01 00 0A 00 8A
C660:64 00 E8 03 10 FE EE 78 40
C668:C6 AE 78 C6 09 30 9D D0 95
C670:06 60 00 00 00 00 00 00 19
C678:00 00 00 00 00 00 00 00 06
C680:00 00 00 00 00 00 00 00 0E
C688:00 00 A9 93 20 D2 FF A2 73
C690:00 20 80 C3 A0 FF A9 03 CD
C698:99 FF D7 99 FE D8 99 FD 14
C6A0:D9 99 FC DA 88 D0 F1 A9 E3
C6A8:A3 85 FB A9 04 85 FC A0 54
C6B0:00 A9 A0 91 FB 20 9E C7 3B
C6B8:C8 98 C9 0C D0 F3 A9 A3 18
C6C0:85 FB A9 D8 85 FC A0 00 34
C6C8:A9 A0 91 FB 20 9E C7 C8 19
C6D0:98 C9 0C D0 F3 A9 B3 85 DE
C6D8:FB A9 04 85 FC A0 00 A9 BB
C6E0:A0 91 FB 20 9E C7 C8 98 E2
C6E8:C9 0C D0 F3 A9 B3 85 FB DA
C6F0:A9 D8 85 FC A0 00 A9 A0 03
C6F8:91 FB 20 9E C7 C8 98 C9 98
C700:0C D0 F3 A9 B4 85 FB A9 40
C708:04 85 FC A0 00 A9 A0 91 1E
C710:FB 20 9E C7 C8 98 C9 0C 3E
C718:D0 F3 A9 B4 85 FB A9 D8 D5
C720:85 FC A0 00 A9 A0 91 FB B4
C728:20 9E C7 C8 98 C9 0C D0 C9
C730:F3 A9 C4 85 FB A9 04 85 29
C738:FC A0 00 A9 A0 91 FB 20 6C
C740:9E C7 C8 98 C9 0C D0 F3 C7
C748:A9 C4 85 FB A9 D8 85 FC 07
C750:A0 00 A9 A0 91 FB 20 9E CA
C758:C7 C8 98 C9 0C D0 F3 A0 D9
C760:00 A9 A0 99 A3 04 C8 98 5F
C768:C9 21 D0 F5 A0 00 A9 00 F6
C770:99 A3 D8 C8 98 C9 21 D0 5C
C778:F5 A0 00 A9 A0 99 5B 06 ED
C780:C8 98 C9 21 D0 F5 A0 00 85
C788:A9 00 99 5B DA A9 0B 99 03
C790:D3 DA A9 0C 99 23 DB C8 90
C798:98 C9 21 D0 EB 60 18 A5 CE
C7A0:FB 69 27 85 FB A5 FC 69 9F
C7A8:00 85 FC 60 A0 00 B9 BF 77
C7B0:C7 C9 00 F0 09 E9 40 99 AF
C7B8:9D 3F C8 4C AE C7 60 4D 67
C7C0:41 5A 45 60 4D 41 53 54 A0
C7C8:45 52 00 00 00 00 00 00 8F
C7D0:00 00 A0 18 A9 00 99 00 76
C7D8:D4 88 D0 FA A9 0F 8D 18 7B
C7E0:D4 A9 02 8D 00 D4 A9 26 2B
C7E8:8D 01 D4 A9 0B 8D 05 D4 22
C7F0:A9 02 8D 06 D4 A9 04 8D CA
C7F8:07 D4 A9 1E 8D 08 D4 A9 38
C800:0F 8D 0C D4 A9 02 8D 0D C8
C808:D4 60 00 00 00 00 00 00 1C
C810:00 00 00 00 00 00 00 00 A1
C818:00 00 00 00 00 00 00 00 A9
C820:00 00 00 00 00 00 00 00 B1
C828:00 00 00 00 00 00 00 00 B9
C830:00 00 00 00 00 00 00 00 C1
C838:00 00 A0 00 B9 8A C8 C9 31
C840:00 F0 07 20 D2 FF C8 4C 65
C848:3C C8 A2 00 AD 86 C8 85 1D
C850:AA AD 88 C8 85 A9 85 AB C9
C858:A0 00 AD 40 03 91 AA C8 70
C860:C0 0F D0 F9 18 A5 AA 69 E5
C868:28 85 AA 90 02 E6 AB E8 B9
C870:E0 0A D0 E4 EE 78 C6 EE 33
C878:40 03 A5 C5 C9 40 F0 03 30
C880:4C 0A C0 4C 4A C8 00 00 0D
C888:00 00 13 11 11 90 92 20 9D
C890:20 20 20 20 20 50 52 45 6C
C898:53 53 20 41 4E 59 20 4B 24
C8A0:45 59 20 54 4F 20 50 4C 5C
C8A8:41 59 20 41 47 41 49 4E 69
C8B0:00 00 00 00 00 00 00 00 42
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

128 Test Sorter

Article on page 71.

```
HE 10 REM COPYRIGHT 1988 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XK 20 POKE47,10:POKE48,250:CLR
      :REM MOVE VARIABLE START
       TO 64010
KK 30 SCNCLR:PRINTTAB(14);"TEX
      T SORTER":PRINT"
      {3 SPACES}COPYRIGHT 1988
       COMPUTE! PUB., INC."
AR 40 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED":PRINT:I
      FPEEK(215)=128THENFAST
HH 50 PRINTCHR$(14)"PLEASE WAI
      T..."CHR$(142)CHR$(145):
      GOSUB760
XR 60 N$="":D$="":D1$="":U$=CH
      R$(145):F$="":K$="":E=0:
      M$="":X=0:L=0
JB 70 C$="":Y$="":L$=CHR$(14):
      B$=CHR$(142):D=0:T=0:P$=
      "@":ES="£"
MK 80 S$="{40 SPACES}":REM 40
      {SPACE}SPACES
HA 90 INPUT"SOURCE FILENAME";N
      $:IFN$=""THEN640
XS 100 IFLEN(N$)>16THENPRINTU$
      ;:GOTO90
FQ 110 INPUT"KEEP LABELS IN SO
      RTED FILE{2 SPACES}Y
      {3 LEFT}";K$
RP 120 IFK$<>"Y"ANDK$<>"N"THEN
      PRINTU$;:GOTO 110
MF 130 INPUT"OUTPUT TO {RVS}D
      {OFF}ISK, {RVS}P{OFF}RI
      NTER, {RVS}S{OFF}CREEN
      {2 SPACES}P{3 LEFT}";D$
DM 140 IFD$<>"P"ANDD$<>"D"ANDD
      $<>"S"THENPRINTU$;:GOTO
      130
HH 150 IFD$="D"THENINPUT"SORTE
      D FILENAME";F$:IFF$=""T
      HENPRINTU$;:GOTO150
XD 160 IFLEN(F$)>16THENPRINTU$
      ;:GOTO150
RF 170 INPUT"LIST ALL LABELS I
      N WHOLE FILE{2 SPACES}N
      {3 LEFT}";Y$
KF 180 IF Y$="N"THEN220:ELSEIF
      Y$<>"Y"THENPRINTU$;:GOT
      O170
SJ 190 INPUT"LIST TO {RVS}P
      {OFF}RINTER OR {RVS}S
      {OFF}CREEN{2 SPACES}P
      {3 LEFT}";D1$
RC 200 IFD1$<>"P"ANDD1$<>"S"TH
      ENPRINTU$;:GOTO190
QR 210 :
KS 220 POKE249,ASC(E$)
AP 230 POKE 251,16:POKE 252,4:
      REM DATA START (1040 BN
      K 1)
RR 240 POKE 253,1:POKE 254,250
      :REM LOAD LIMIT (64000+
      1 BNK 1)
FB 250 POKE3202,ASC(P$):REM SO
      RT CODE
RP 260 POKE3203,0:IFY$="Y"THEN
      POKE3203,1
KJ 270 POKE3205,0:REM LABEL PO
      INTER
KH 280 POKE3207,1:IFK$="N"THEN
      POKE3207,0:REM KEEP LAB
      ELS?
BP 290 POKE 3208,16:POKE 3209,
      4:REM DATA RESET
ED 300 :
SS 310 PRINT:PRINT"LOADING ";N
      $
EB 320 OPEN1,8,15:TRAP720:OPEN
      2,8,2,"0:"+N$:TRAP
RQ 330 INPUT#1,E,M$:IFETHEN630
JK 340 SYS2816:CLOSE2:Y$="":RE
      M LOAD
AH 350 :
SF 360 IFPEEK(144)=64THEN390
EX 370 PRINTCHR$(7):PRINT"MEMO
      RY FULL--";:INPUT"PARTI
      AL OK{2 SPACES}N
      {3 LEFT}";Y$
KC 380 IFY$="N"THEN640
FJ 390 IFPEEK(3203)=0THENPRINT
      U$S$U$:GOTO450
GG 400 PRINTU$S$U$:INPUT"LABEL
       LIST READY--PRESS RETU
      RN";Y$:GOSUB1140:GOSUB6
      70
BB 410 TRAP720:PRINT#4,"LABELS
       USED IN "N$CHR$(13):TR
```

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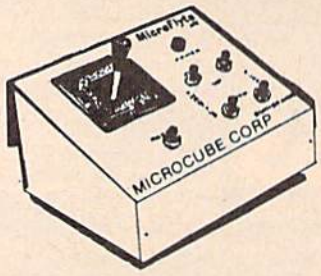

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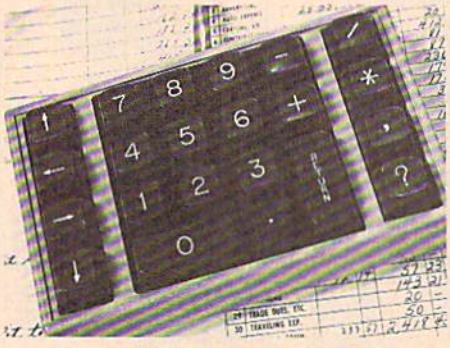

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```
      AP:POKE3203,2:PRINTL$;
EP 420 SYS2816
XX 430 PRINTB$:PRINT#4:CLOSE4
XQ 440 :
MQ 450 X=0:T=4864:PRINT"ENTER
       {SPACE}SORT LABELS IN D
       ESIRED ORDER"
EC 460 PRINTB$"(N"L$"O COMMAS,
        QUOTES OR COLONS!)":PR
       INT
DF 470 PRINTB$"{2 SPACES}LABEL
       "X+1;L$;:INPUTC$:IFC$<>
       ""THENL=L+LEN(C$)+1
BF 480 IFL>2303THENPRINTCHR$(7
       )B$"L"L$"ABEL MEMORY FU
       LL--LAST ENTRY VOIDED."
       :ELSE500
XG 490 C$="":PRINTB$:INPUT"OK
       {2 SPACES}Y{3 LEFT}";Y$
       :IFY$<>"Y"THEN640
PS 500 IFC$=""THENPOKE T,0:X=X
       -1:PRINT:GOTO540
EA 510 C$=C$+CHR$(13)
SX 520 D=1:FOR T=T TO T+LEN(C$
       )-1:POKE T,ASC(MID$(C$,
       D,1)):D=D+1:NEXT
DD 530 C$="":X=X+1:GOTO470
AJ 540 PRINT:IFX<0THENPRINTB$:
       GOTO640
RH 550 T=X:PRINTU$S$U$B$
RE 560 :
PB 570 PRINT:INPUT"READY FOR S
       ORTED OUTPUT--PRESS RET
       URN";Y$
HH 580 GOSUB690:IFD$="D"THENIN
       PUT#1,E,M$:IFETHEN630
HX 590 IFD$<>"D"THENTRAP720:PR
       INT#4,"";:TRAP
FS 600 PRINT:IFD$="D"THENPRINT
       "WORKING..."U$
CM 610 POKE253,0:POKE254,19:PO
       KE 3206,19:REM LABEL AD
       DR & RESET BUF (4864)
CQ 620 SYS 2887
JJ 630 IFETHENPRINT"ERROR"E,M$
SA 640 DCLOSE:CLOSE4:PRINTCHR$
       (142):PRINT"DONE"
FF 650 POKE47,0:POKE48,4:CLR:E
       ND:REM FIX MEMORY
MM 660 :
HD 670 IFD1$="S"THENOPEN4,3:PR
       INTL$:ELSEOPEN4,4,7
JA 680 RETURN
DB 690 IFD$="S"THENOPEN4,3:PRI
       NTL$:RETURN
EG 700 IFD$="P"THENOPEN4,4,7:R
       ETURN
SD 710 TRAP720:OPEN4,8,2,"0:"+
       F$+",S,W":TRAP:RETURN
MA 720 CLOSE2:IF D$="D"ANDPEEK
       (3203)<>1THENCLOSE4
EP 730 POKE241,31:PRINTCHR$(7)
       "DISK OR PRINTER OFF!
       {2 SPACES}RETURN WHEN R
       EADY"
JC 740 DOWHILE PEEK(213)=88:LO
       OP:POKE208,0:PRINTU$S$U
       $:RESUME
CA 750 :
AS 760 FOR X=2816 TO 3081:READ
       T:D=D+T:POKEX,T:NEXT
HB 770 IF D<>34036THENPRINTCHR
       $(7)"ERROR IN DATA":GOT
       O630
RG 780 RETURN
BF 790 DATA 24,162,2,32,198,25
       5,169,251
CR 800 DATA 141,185,2,160,0,32
       ,207,255
KR 810 DATA 32,55,11,166,144,2
       24,64,240
MA 820 DATA 12,166,252,228,254
       ,208,238,166
BR 830 DATA 251,228,253,208,23
       2,201,13,240
RM 840 DATA 5,169,13,32,55,11,
       165,249
JF 850 DATA 32,55,11,32,204,25
       5,96,120
BB 860 DATA 162,1,32,119,255,8
       8,230,251
QE 870 DATA 208,2,230,252,96,2
       34,234,162
EA 880 DATA 4,32,201,255,173,1
       36,12,133
XM 890 DATA 251,173,137,12,133
       ,252,162,0
JH 900 DATA 142,128,12,172,133
       ,12,177,253
RJ 910 DATA 208,4,32,204,255,9
       6,141,129
JH 920 DATA 12,32,241,11,197,2
       49,240,106
CM 930 DATA 174,128,12,208,27,
       205,130,12
JF 940 DATA 240,6,32,3,12,76,1
       05,11
EQ 950 DATA 166,251,142,138,12
       ,166,252,142
EB 960 DATA 139,12,32,3,12,32,
       241,11
BK 970 DATA 205,129,12,240,8,1
       74,134,12
XS 980 DATA 134,254,76,86,11,2
       01,13,240
PD 990 DATA 16,162,1,142,128,1
       2,200,208
JP 1000 DATA 2,230,254,32,3,12
       ,76,94
PG 1010 DATA 11,162,0,142,128,
       12,174,135
BM 1020 DATA 12,240,16,174,138
       ,12,134,251
RS 1030 DATA 174,139,12,134,25
       2,32,241,11
DM 1040 DATA 32,210,255,32,3,1
       2,32,241
XF 1050 DATA 11,205,130,12,240
       ,191,197,249
BM 1060 DATA 208,238,177,253,2
       00,208,2,230
HA 1070 DATA 254,201,13,208,24
       5,140,133,12
CK 1080 DATA 164,254,140,134,1
       2,76,76,11
GE 1090 DATA 234,140,132,12,12
       0,169,251,162
ME 1100 DATA 1,160,0,32,116,25
       5,88,172
BM 1110 DATA 132,12,96,230,251
       ,208,2,230
BE 1120 DATA 252,96
JP 1130 REM DATA FOR LABEL LIS
       T
KD 1140 D=0:FOR X=2816 TO 2870
       :READT:D=D+T:POKEX,T:N
       EXT
AR 1150 IFD<>7426THENPRINTCHR$
       (7)"ERROR IN LIST DATA
       ":GOTO630
DJ 1160 RETURN
KP 1170 DATA 24,162,4,32,201,2
       55,173,136
FF 1180 DATA 12,133,251,173,13
       7,12,133,252
MC 1190 DATA 162,0,134,253,32,
       244,11,32
KH 1200 DATA 3,12,197,249,240,
       21,166,253
CB 1210 DATA 208,7,205,130,12,
       208,237,230
DH 1220 DATA 253,32,210,255,20
       1,13,208,228
RD 1230 DATA 76,16,11,32,204,2
       55,96
```

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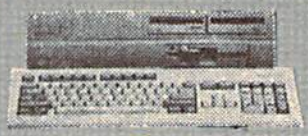

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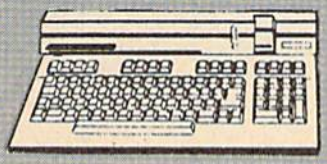

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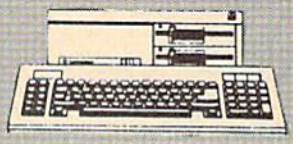

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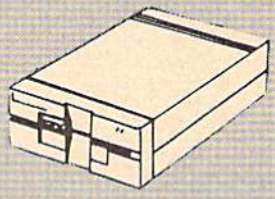

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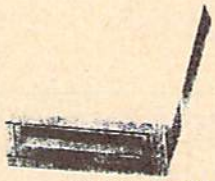

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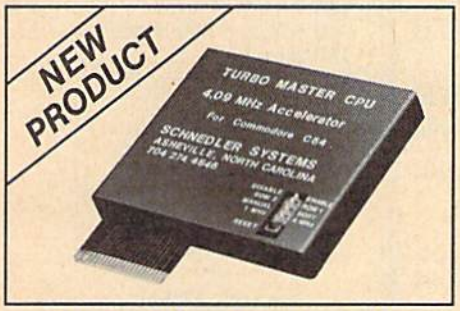

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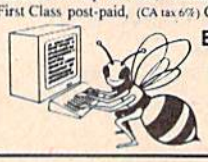

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If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

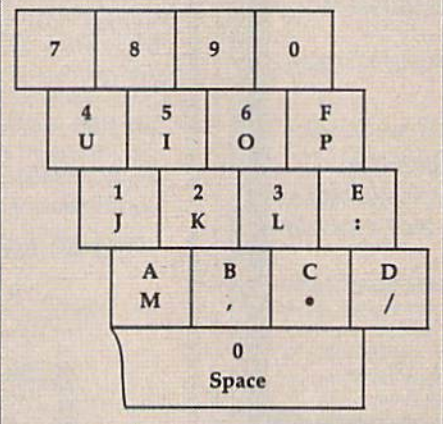
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

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played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, and then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, and then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}[8 @]
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[4]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[4]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
```


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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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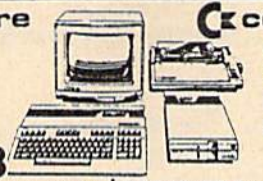

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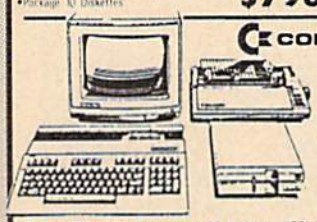

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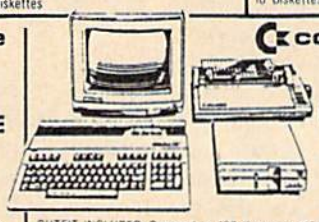

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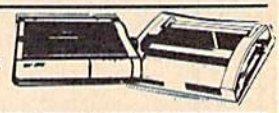

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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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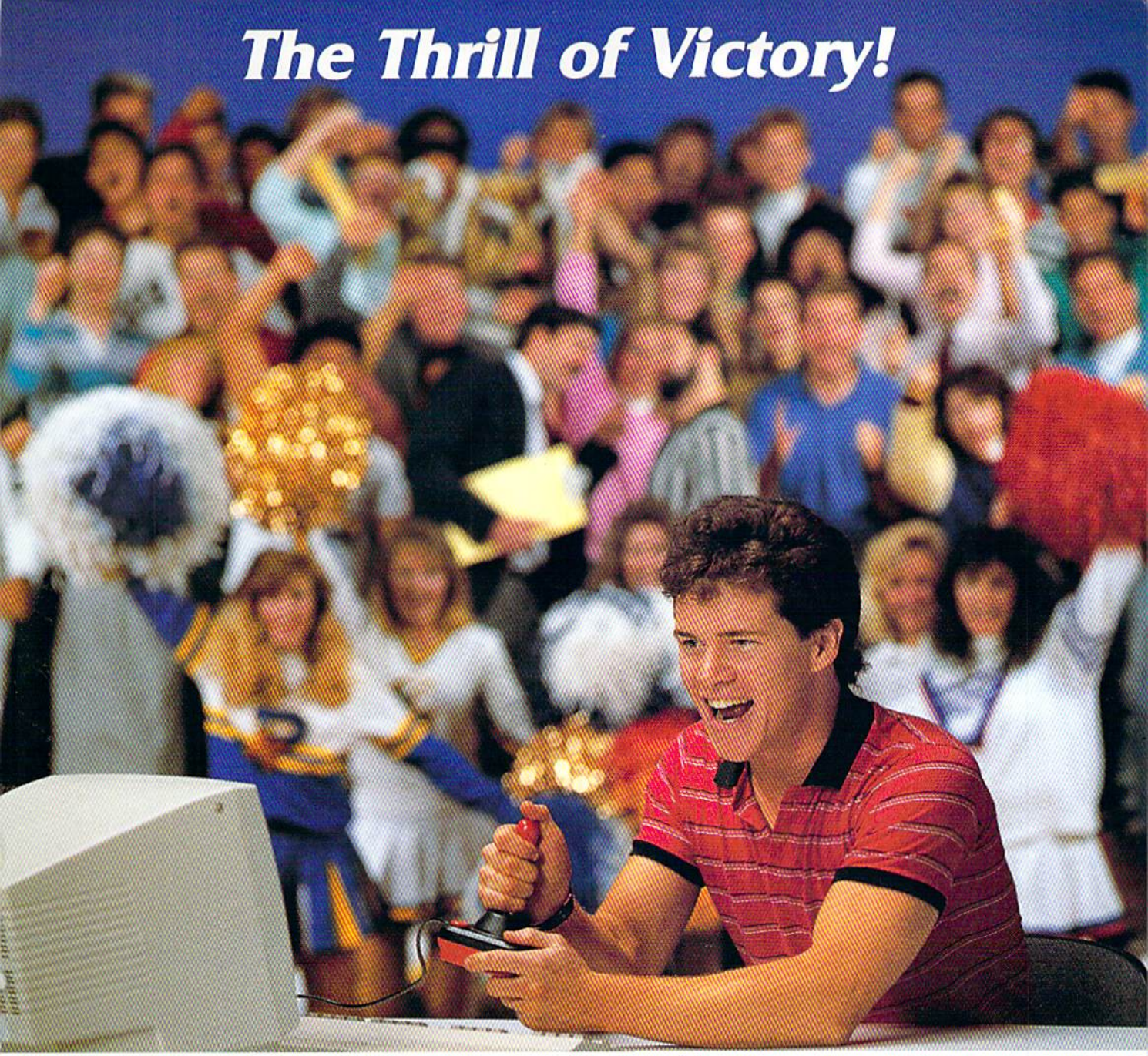

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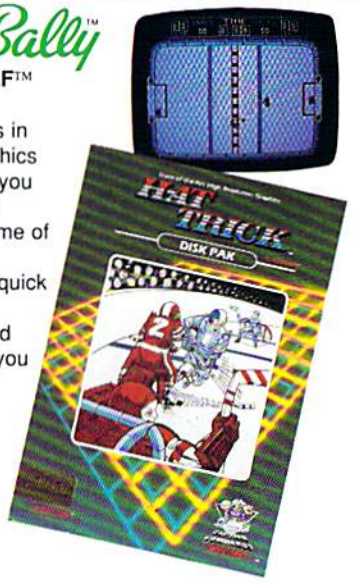

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